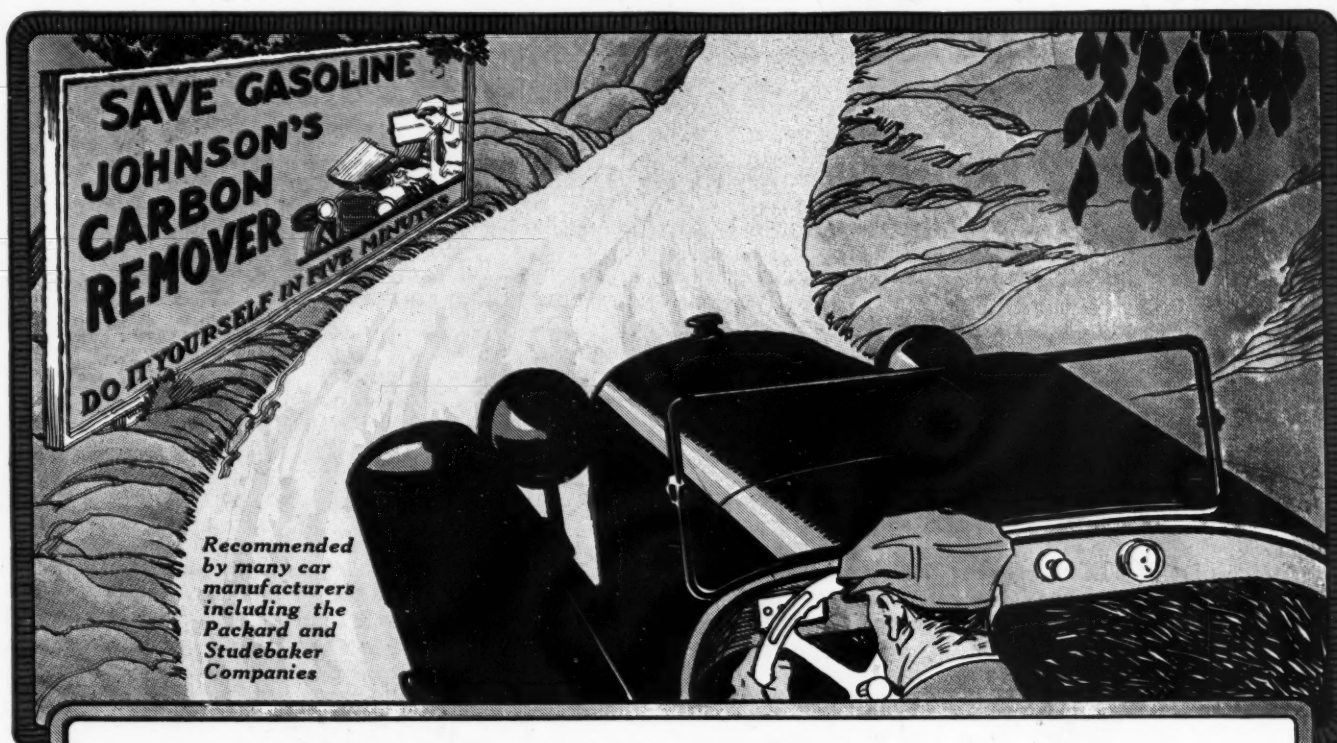


# MOTOR AGE

Vol. XXXIV  
No. 11

PUBLISHED WEEKLY  
CHICAGO, SEPTEMBER 12, 1918

Fifteen cents a copy  
Three dollars a year



**H**AS YOUR CAR lost its "pep"? Is the motor getting sluggish? Does it knock on an up-grade? These and countless other engine troubles are caused by carbon. The easiest, cleanest, safest and most satisfactory method of removing carbon deposits is with Johnson's Carbon Remover. It will save you from \$2.00 to \$5.00 over any other method without laying up your car. You can do it yourself in five minutes.

## JOHNSON'S CARBON REMOVER

The use of Johnson's Carbon Remover every five hundred miles will automatically eliminate valve trouble and keep your motor clean and smooth and at its highest efficiency.

Carbon-free cylinders will reduce your gas and oil consumption 12% to 25% and give you the maximum power and speed from the minimum amount of fuel.

You can clean a four-cylinder motor four times with a pint of Johnson's Carbon Remover. If your dealer cannot supply you send us \$1.00 and we will forward you a pint prepaid.

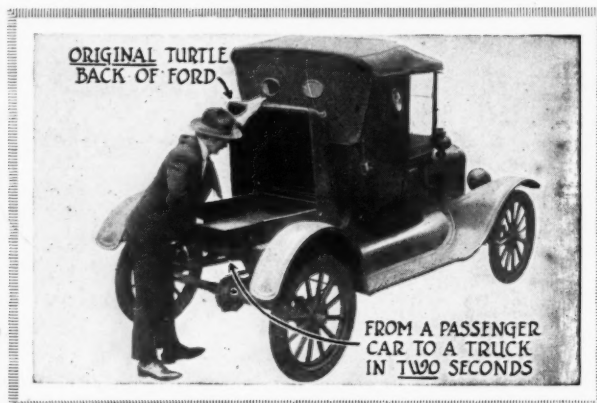
Write for our booklet on "Keeping Cars Young." It will tell you how to reduce automobile depreciation. We gladly send it free and postpaid.

S. C. JOHNSON & SON, Dept. MA, RACINE, WIS.



# The Dealers' Problem Now Is to Sell Essential Lines

E  
C  
O  
N  
O  
M  
Y



C  
O  
N  
S  
E  
R  
V  
A  
T  
I  
O  
N

THE dealers' field is gradually narrowing. Luxuries and non-useful products are meeting their doom one by one. So the far seeing, progressive dealers are now taking on useful lines of merchandise to keep their business close to normal.

## UTILITY DISAPPEARING TRUCK

*From a Ford Roadster to a Half-Ton Truck in 2 Seconds*

The Utility Disappearing Truck offers such unusual features of economy that business men everywhere are quick to see its possibilities and adopt it in their business. It is not a novelty. It is not an accessory. It is a real half ton truck that telescopes under the original turtle back of any Ford roadster. In two seconds (by actual experiment) the roadster is converted into a half ton truck.

Price Only **\$38.50** Complete

### A STRONG, DURABLE HALF TON TRUCK

The truck is completely out of sight, telescoped under the original turtle back of the Ford. The car is not disfigured in any way—it looks just as it always did with no hints of the truck when it is not in use. The turtle back cannot be marred or injured. It lifts up and protects back of seat from scratches.

#### UTILITY Sure-Grip Pedals for Fords

Absolutely prevent foot slipping from clutch or brake pedal. **UTILITY** Sure-Grip pedals transform the small, smooth Ford pedals into standard size, safe, comfortable pedals. Attached instantly—no holes to drill, no special tools required—one nut to tighten and the job is done. Once they are installed they absolutely cannot slip off.

DEALERS—Order a sample pair.



\$1.25 Per Pair

Can be completely installed by **anyone** with a hammer and wrench in one hour. Only four bolts used in attaching it. No rattle—no vibration. Will haul any load up to a half ton. Made of heavy gauge steel finished in black baked enamel to match finish of car. Can be pulled out to desired length. No bolts or rivets used in its construction. It is acetylene welded throughout.

Makes a Ford the most useful car on the market.

#### DEALERS!

Here is an extremely **USEFUL PRODUCT** that you should be handling. Ask your jobber to supply you

**HILL PUMP VALVE COMPANY**

Archer Avenue and Canal Street

CHICAGO, U. S. A.

Sales Department: THE ZINKE COMPANY, 1323 S. Michigan Avenue, CHICAGO





*Merit believes in keeping company with the best. As the Equipment—so the Car.*

**Cars Equipped With the Waltham Automobile Clock**

Anderson 6-40	Fergus	Owen-Magnetic
Apperson	Franklin	Packard
Brewster	Haynes	Pierce-Arrow
Cadillac	Hal	Rauch & Lang
Chalmers	Hudson Super-Six	Rolls-Royce
Cole	Jordan	Simplex
Crane	Kissel	Stearns
Cunningham	Locomobile	Studebaker
Detroit-Electric	Marmon	Willys-Overland
Doble	Mercer	Winton
	Murray	

## The Waltham Automobile Clock

More Than a Quarter-Million Now in Use as Standard Equipment

A faultless time-guide for the drivers of America's leading cars. So accurate that many motorists use it to regulate the time in their homes and offices.

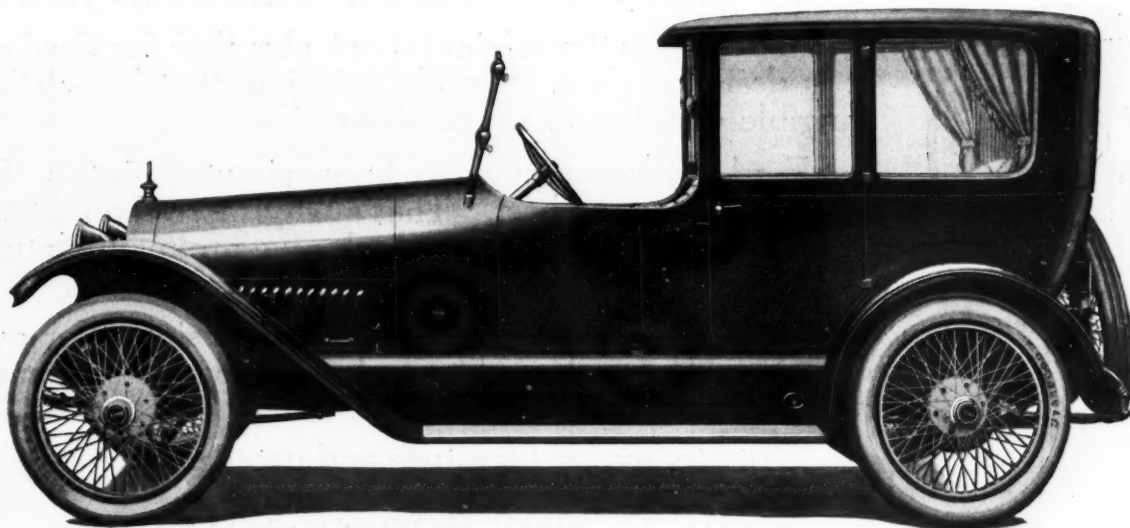
Scientifically built to resist the shocks of travel and the changes

in temperature. Has two main-springs, is jeweled and a red signal on the dial reminds you when winding is needed—only once in eight days.

There's a model built to harmonize with the luxurious fittings of

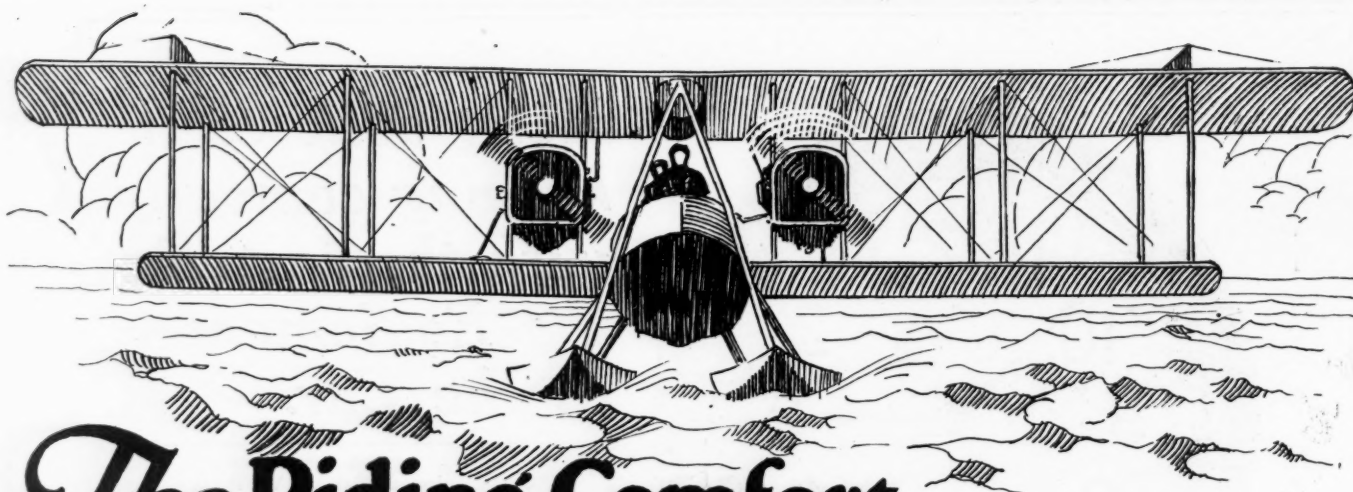
the finest car—whether it be limousine, sedan, coupe, roadster or touring. And you can judge the "class" of an automobile by looking to see if it carries a Waltham.

**WALTHAM WATCH CO., WALTHAM, MASS.**



*Haynes "Light Twelve" Equipped with the Waltham Automobile Clock*





## *The Riding Comfort of a Hydroairplane*

A Ford car equipped with W & C Shock Absorbers rides along with the ease and grace of a hydroairplane. A Ford driver cannot know the wonderful riding comfort that his car is capable of until he has installed a set of W & C Shock Absorbers.

During the past three years thousands of Ford owners have attested the worth and merit of W & C's.

**\$10<sup>00</sup>**

*Per Set of Four*



## **W. & C.** **SHOCK ABSORBERS** *The Original Double Arm Shock Absorbers for Fords*

W & C was the original shock absorber for Ford cars. It is designed on a scientific principle that has definite, tangible qualities in shock absorption.

Ford owners everywhere know about W & C's. They **know** they are the best. That's why more than 200,000 sets are in use right now and why we are manufacturing more W & C Shock Absorbers than ever before.

W & C means bigger and better business for every dealer. They sell readily and every owner becomes a booster.

Write today for literature and details.

**P. H. WEBBER COMPANY**

HOOPESTON

ILLINOIS

# MOTOR AGE

Published Every Thursday by  
**THE CLASS JOURNAL COMPANY**  
 MALLERS BUILDING  
 59 E. Madison St., CHICAGO  
 HORACE M. SWETLAND, Pres. W. I. RALPH, Vice-Pres.  
 E. M. COREY, Treas. A. B. SWETLAND, Gen. Mgr.  
 MEMBER OF THE AUDIT BUREAU OF CIRCULATIONS

Vol. XXXIV Chicago, September 12, 1918 No. 11

## CONTENTS

Copyright 1918 by THE CLASS JOURNAL COMPANY

Co-operative Sales and Service Station....	7
Making the Repairshop Pay.....	12
Editorial .....	14
New Preferential List.....	16
Laundrying Motor Cars.....	18
Tractors at Indianapolis.....	20
Registration Figures .....	22
Service Without a Come-back.....	26
Tests of Side Draft.....	28
Piston Displacement Chart.....	30
Colorado Return Loads.....	31
Torbensen Rear Axles.....	32
Electrical Equipment of the Motor Car.....	34
Development .....	44
All-American truck and catalytic spark plug described and illustrated.	

### DEPARTMENTS

Motor Car Repair Shop.....	36
Readers' Clearing House.....	38
Accessory Corner .....	46
Among the Makers and Dealers.....	48
From the Four Winds.....	50

### NOTICE

Effective with this number, the newsstand, or single-copy, price of **MOTOR AGE** will be advanced to 15 cents.

The present yearly subscription rate of \$3 will remain the same until further notice.

## MOTOR AGE

MALLERS BUILDING CHICAGO Phone Randolph 6960

E. E. HAIGHT, Manager  
 DAVID BEECROFT DARWIN S. HATCH  
 Directing Editor Managing Editor

BRANCH OFFICES  
 DETROIT, 95 Fort St. W. CLEVELAND, 536-540 Guardian Bldg.  
 Phone Main 1351 Phone Main 1142  
 NEW YORK CITY, U. P. C. Bldg., 231-241 W. 39th St.,  
 Phone Bryant 8760

### SUBSCRIPTION RATES

United States, Mexico and U. S. Possessions...	\$3.00 per year
Canada .....	5.00 per year
All other Countries in Postal Union.....	6.00 per year
Single Copies .....	15 cents

Entered as second-class matter, September 19, 1899, at the Post Office, Chicago, Illinois, under Act of March 3, 1879.  
 Owned by UNITED PUBLISHERS CORPORATION, 243 W. 39th St., New York. H. M. Swetland, Pres.; Charles S. Phillips, Vice-Pres.; W. H. Taylor, Treas.; A. C. Pearson, Secretary.



## ONE INCH FIRING SURFACE

—a patented feature, exclusive with NATIONAL SPARK PLUG.

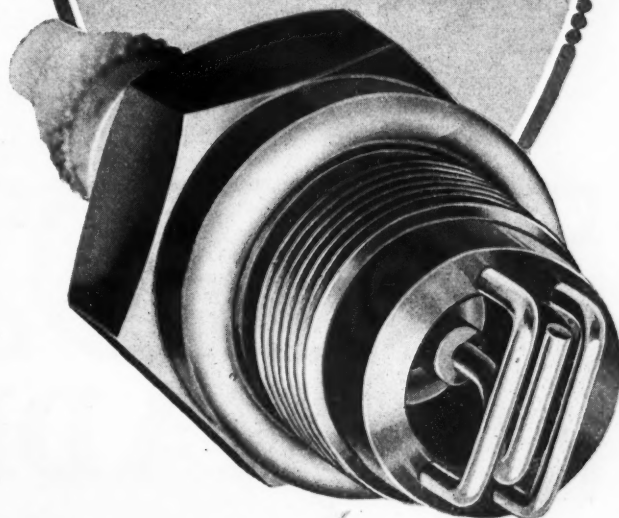
No other spark plug can use it. No one but the NATIONAL dealer can sell a plug that has it.

The logical spark plug for discriminating owners of passenger cars, trucks, and tractors. Unsurpassed wherever continuous heavy service is imperative.

Price \$1.00 each, at most good dealers. Guaranteed for 365 days.

DEALERS: Write for exceptionally interesting proposition

BERGIE NATIONAL SPARK PLUG CO.  
 ROCKFORD, ILLINOIS, U. S. A.







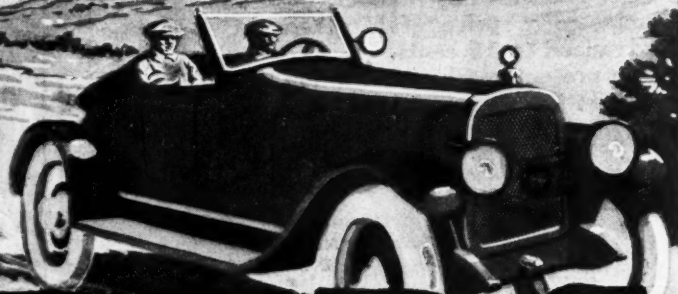
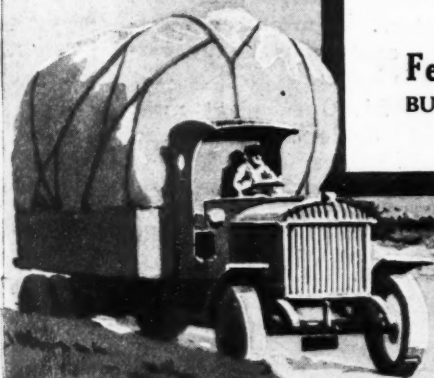
## For Every Motor-Driven Vehicle

that travels on the ground or flies in the air, there's a Fedders Radiator designed and built to keep its motor running cool under all conditions of service.

That Fedders Radiators serve best, is proven by the fact that most of the best vehicles are Fedders equipped.

*Let Fedders help solve  
your Radiator Problems*

**Fedders Manufacturing Co., Inc.**  
BUFFALO NEW YORK



# FEDDERS RADIATORS

## Let's Look Ahead

For every downgrade taken with ease there is an upgrade to be taken with effort. The business man who rests content with inflated business brought about by abnormal conditions will find himself in an embarrassing position when conditions once again assume their normal aspect. The prestige that his name, or the name of his product once held will have suffered through lack of a constructive policy of looking far ahead and anticipating developments.

Conditions cannot remain as they are. With the end of the war will come a readjustment—gradual, we hope. Business will settle once more into its established channels. There will be changes, to be sure—changes that will have a lasting effect on industry as a whole. But these changes will be individual in nature and not all-inclusive.

One change, however, is bound to happen. It is unavoidable. Efforts that were formerly spent in bringing victory to us and our allies will be reverted to former channels and the barometer of competition will indicate interesting things.

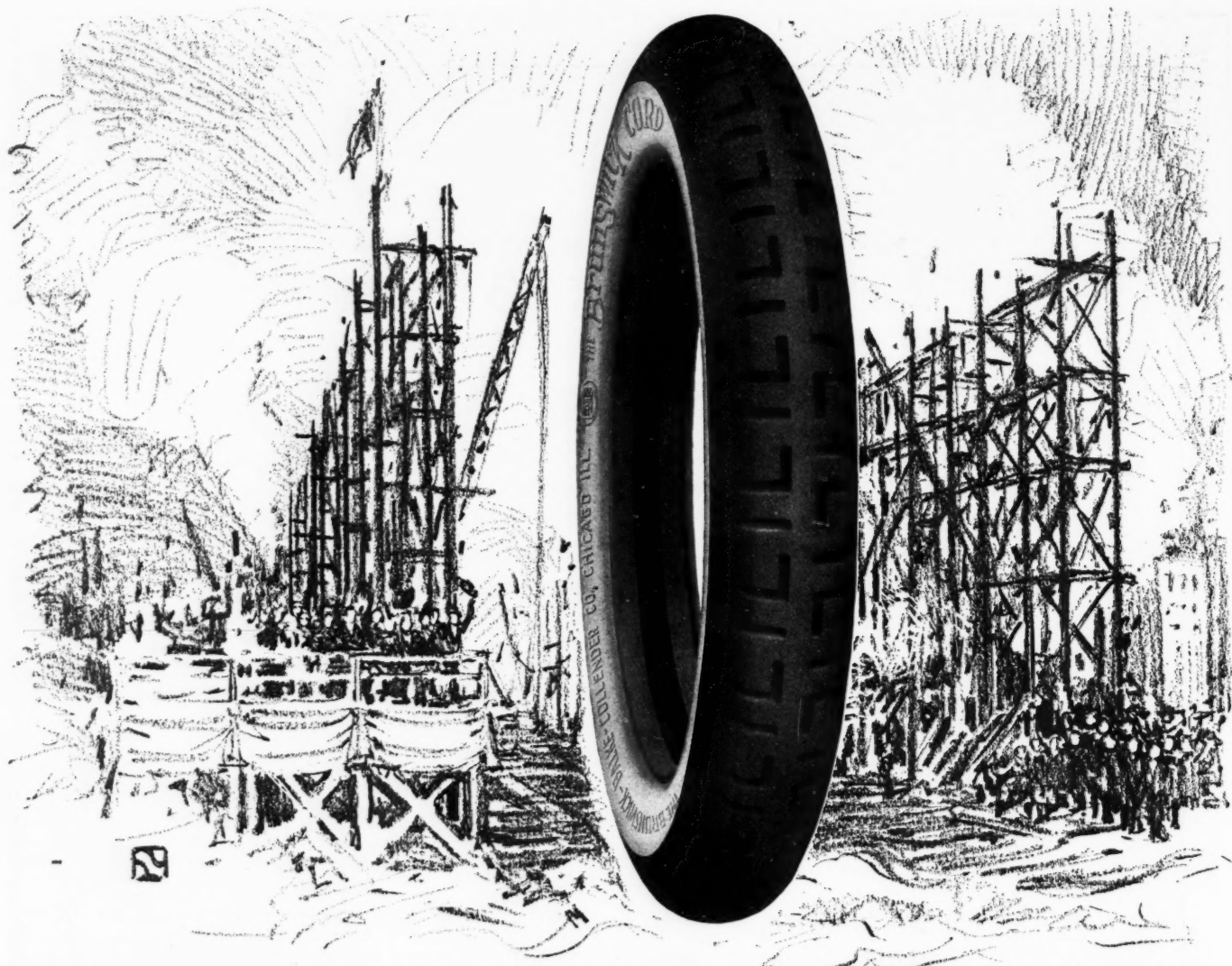
Competition plays no favorites. It is a race to the finish. After the war competition will be keener than ever before.

The far-seeing merchandiser will not lessen his efforts in keeping before the dealer and his immediate prospects, the **name** of his product, coupled with its advantages.

He will not apply the brakes to his established policy. He will anticipate the grade ahead, even though he cannot see it.

Let's look ahead and be preparing for the upgrade now.





## Launching the Composite Cord Embodying All That Is Good in Tires

**W**ITH Brunswick thoroughness, our experts made exhaustive tests of other makes before we manufactured the Brunswick Cord Tire, which we now offer to the public with the utmost assurance that it excels all others.

Our tests determined which, among all tires, represented the highest development in methods of manufacture, in material or in standard of construction.

We adopted the best in every particular. Brunswick thoroughness goes into the manufacture of Brunswick

Hand-made Cord Tires. Brunswick prestige—based on 73 years of turning out the best in every Brunswick line—is back of them.

Good tire making is a matter of principle. Any good maker can build a good tire, but cost and competition modify ideals.

### TO DEALERS

Brunswick Cord Tires, through widespread advertising, the Brunswick name, and finally through the experience of car owners, are destined to make a leading place for themselves.

An established organization and branches in every center guarantee economical, quick distribution, and minimize overhead and selling expense. That means extra values.

Write for our dealer proposition on Brunswick tires and tubes.

The Brunswick ideal—to pay the price for perfection and get it—and the Brunswick principle are never lost sight of. You will find Brunswick Cord Tires built with that ideal and that principle.

Try the Brunswick Cord Tire. Determine for yourself that it has the best of everything.

The Brunswick-Balke-Collender Company

Branches in Principal Cities of United States and Canada

# Brunswick

## TIRES

General Offices:  
623-633 So. Wabash Av., Chicago

When Writing to Advertisers, Please Mention Motor Age

# MOTOR AGE

## Co-operation *in the* Sales and Service Station

Bringing Under One Roof and Central Control Several Dealers and Garagemen for Wartime Business—  
Idea Already Approved by Various Distributors

**M**OTOR AGE presents herewith ground plans and sectional perspective views of a co-operative motor car sales and service station. Such an institution means bringing under one roof and central control perhaps a dozen or more dealers for the purpose of carrying on their business during war times, or peace times for that matter, in the best possible manner. Naturally this building layout is subject to change by each town, or group of dealer and service stations, as may be most suited to that particular community. The plans shown here are intended to give but a general conception of what such a building might look like when arranged to carry on the sales and service end of cars that heretofore have been handled in various sorts of buildings scattered around over the town.

### Many Advantages

No one can deny the many advantages that accrue from a get-together idea like this. For example, all the dealers have access to the same general repairshop, which it is possible to fit out with a complete equipment of lathes, shapers, planers, etc., machinery which many of the smaller dealers now cannot afford to install. Many a dealer also is stocked up with complete equipment like this but with no mechanics and gladly would move his machinery to the co-operative service shop where it would be put to use.

Recent investigation shows that in some towns shops with a modest equipment and enough help are working full capacity and have to turn away work because they can handle just so many cars or trucks. Such a shop, with proper equipment and plenty of space to house the cars or trucks, can turn out much more work. The additional space is afforded by the co-operative garage. Also, some of the small town dealers are pretty much up against it to get parts and frequently must hold cars in storage or on the shop floor for weeks while parts are coming through, even though they may be coming only from the distributor in the larger city. Once the co-operative garage was stocked up with parts and supplies it would be a veritable warehouse and more parts could be kept because being so large an enterprise, with but one overhead, naturally more money could be put to use on supplies and spare parts.

While there is no denial that there is a serious shortage of expert mechanical help, yet if all the help still available could be brought together under a common roof and facilities installed to speed up service and repairs, there is no question but what it would be a paying enterprise to those concerned. We have seen in many of the smaller Illinois towns dealers with very little business, while their overhead goes on just the same. In one case there was a three-story building, with very good shop facilities yet no mechanics and the dealer had to send his cars to the man across the street because he was fortunate enough to have five good workmen in his repairshop. The latter dealer, whom we shall call Jones, was clamoring for more room, while Smith, with the three-story building, was lamenting his labor shortage. Deep down in his heart Jones wished for Smith's big building, while Smith wished for Jones' men. What's the answer? These two dealers should go out to lunch together, talk it over and move Jones' men and machinery over to Smith's place and together do business under one roof and one overhead, splitting up the profits as they see fit. This is an example of a two-dealer co-operative establishment. The same can be done with more dealers involved.

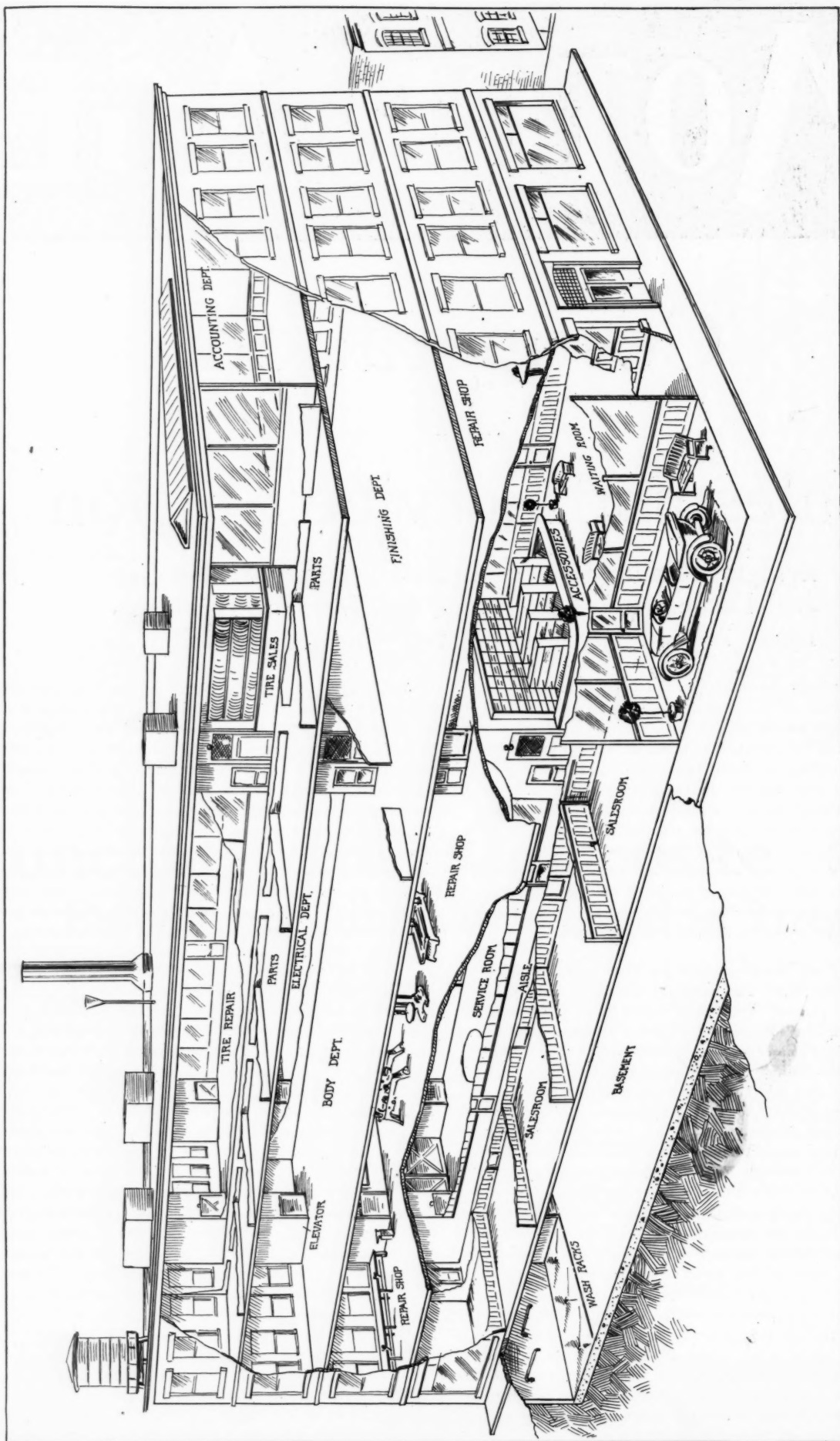
### Can Be Done

Naturally there will be those knocking the proposition on the grounds that you cannot house in the same structure dealers who sell and render service to entirely different makes of cars. That this is possible has been borne out by other lines of business. Take some of the magazines and periodicals published in this country. Some publishers get out as many as twenty or thirty different publications, with one general editorial staff, art department, bookkeeping department, etc. The same presses print all, the same linotype machines set up the type and all are shipped from the same point, with one overhead. All the publications are different, just like cars are different.

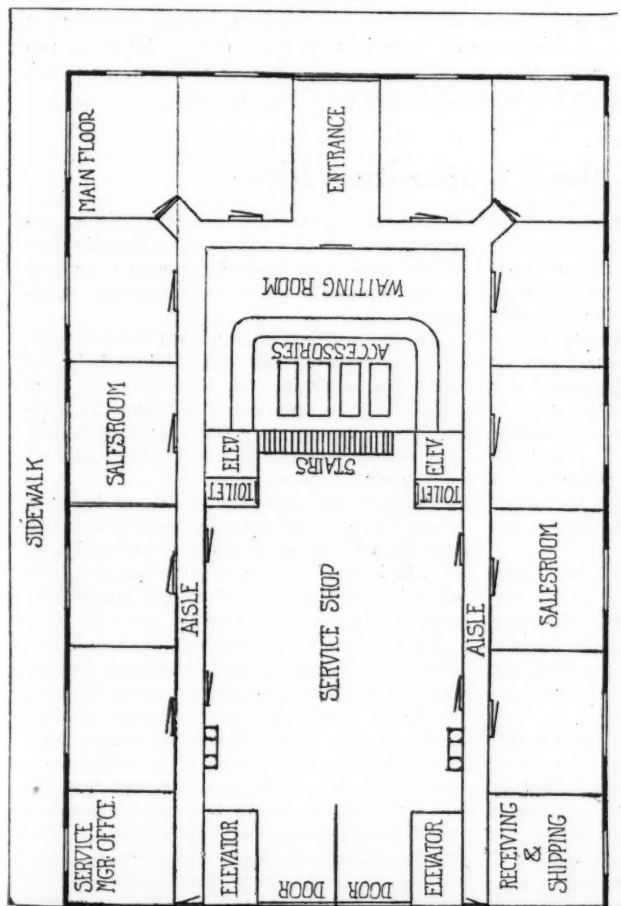
The structure shown herewith should be suitable for a town of say 30,000 or so inhabitants, or much less, with variations. In this particular case twelve different makes of cars are represented and as will be noted, showrooms are provided running around the first floor clear around the building, except for the



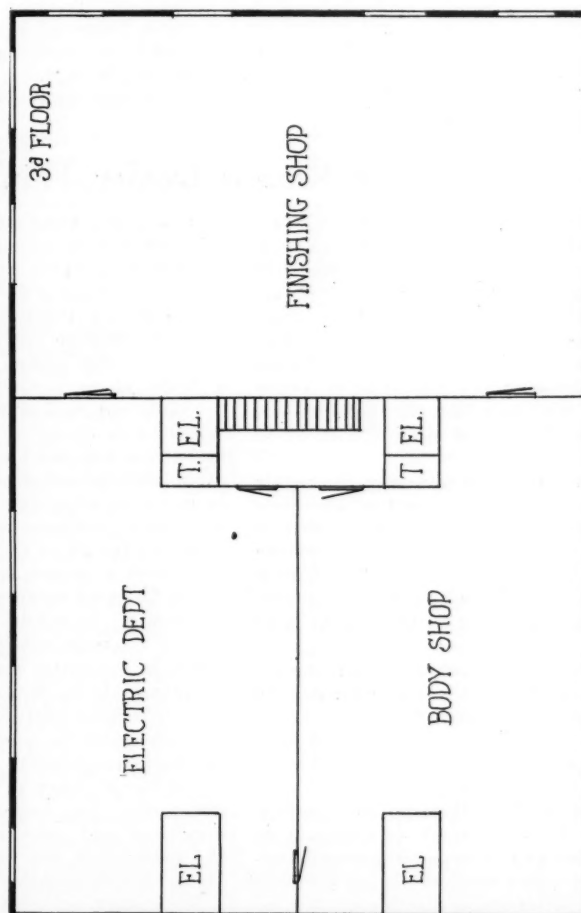
## Perspective View of Co-operative Sales and Service Station



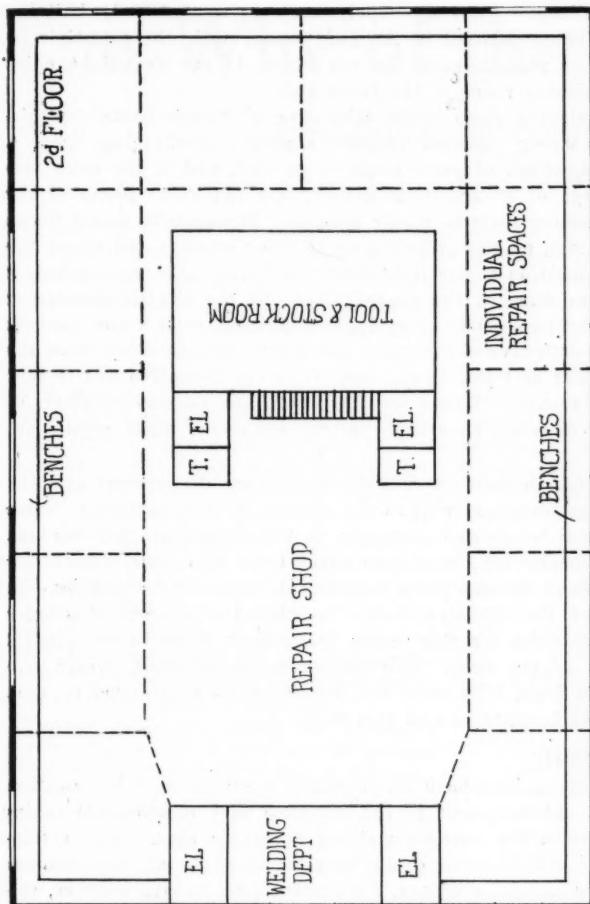
Sectional perspective view of co-operative sales and service garages, showing the general arrangement of the four floors and basement. Immediate service is taken care of on the second floor, while the machine shop and general repair department is on the second floor. Two freight elevators carry cars or trucks to various floors, and two passenger elevators are located near the front of the building. Naturally the size and arrangement of the building would vary with different towns, depending on the number of dealers and the structure available, unless a new one were built. The salesrooms are placed all around the outside, so that each one has the advantage of a large window. A spacious waiting room is for the accommodation of patrons waiting for their cars or those purchasing accessories.



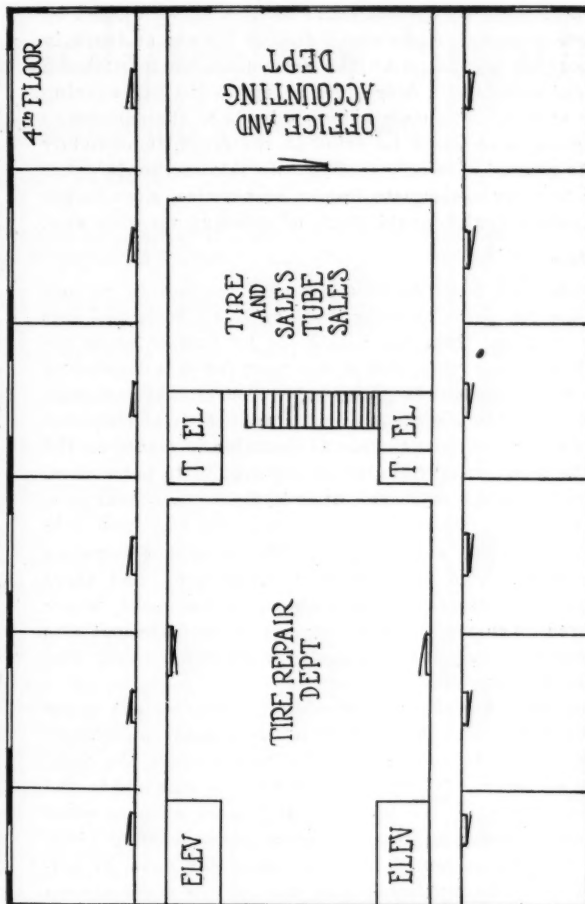
1—Main floor plan, showing twelve salesrooms placed along outside walls with doors opening into aisle running all the way around. Each salesroom is in direct communication with the service department where cars are given minor attention as they come in



3—Third floor layout for co-operative garage. Here we might find a large electric department taking care of all ignition and lighting work. Next to it is the body department, where rebuilding of bodies and fenders is carried on. The finishing room runs across the front



2—Second floor plan, giving an idea of how the repairshop could be arranged. Each dealer would have his individual repair space or section, but all have access to the central machine shop fitted up with lathes, shapers, etc., to care for most any work



4—Fourth floor plan, showing suggested layout for tire repair department, parts and accounting departments. The booths along the outer wall are for housing the parts belonging to respective cars represented by the different dealers. New tires and tire sundries are sold here also



back. Each of these showrooms could be fixed up as wanted by its respective occupant, so he could display his car or truck in whatever way he wanted. All the salesrooms are partitioned off with glass walls and a door gives access to the hall running all the way around. The main entrance leads to the salesrooms and a reception room could be fitted at the front, immediately ahead of the general accessory counter. In this section it would be possible to carry a complete line of accessories, much larger than the average dealer would think of stocking up with now.

#### Two Elevators

At the rear two large doors allow cars to pass in or out. Also, there are two large elevators running to all floors and cars can be run on them from the outside or by first entering the building. The service room, that is, the room for cars demanding immediate service, such as filling the storage battery with water, brake adjustments, etc., is on the main floor and divided off by glass and wood partitions. A turntable is placed in the middle of the floor, so cars can be swung around to point them in any desired direction. In one corner is the service manager's office, where service records, etc., are kept. On the other side is a room for receiving and shipping. The passenger elevators are immediately behind the accessory department, and these carry patrons or workmen to floors above, or basement, where cars are stored when ready. The rear end of the basement also accommodates the wash racks, together with boiler room, coal bins, engine, dynamo, etc.

A building like this offers wonderful facilities on the upper floors. Take the second floor. This is the general repairshop. Here are workbenches running all the way around the wall, with plenty of light. The elevators carry the cars up to the shop. In the center are the lathes, drill presses, shapers, planers, etc., while between the two elevators is the welding room. Each make of car represented in the building can have its particular section in the repairshop and cars of one make always are segregated thus, because the benches and tools in any particular section would be adapted to that particular make of car. But the machinery in the middle of the room would be common to all. In front of the passenger elevators is the tool room, where a general stock of taps, dies, reamers, etc., is kept.

Above the repairshop floor is the electrical division, body and

paint rooms. All body repair work or special body building would be carried out in the body room, while the cars thus repaired or rebuilt, could be run direct to the dust-tight paint and finishing room at the front end.

The electric room would take care of storage battery repairing, charging, ignition trouble, magneto overhauling, etc. A complete stock of parts could be carried, and if the work was in charge of an electrical expert, this important phase of car maintenance could be nicely handled. It naturally would be up to the man on the ground floor to shoot trouble and direct the car in question to the right floor. If tuning only was needed, it would be done on the ground floor. In the electric division it would be possible to carry spare magnetos, so if a car came in with a defective one, a good one would be sent down from the third floor and put in the car, while the defective one is sent up for repairs. Hence the place will not become crowded, as the car does not have to be left by the owner while repairs are made.

The fourth floor carries the accounting department and the tire department, as well as the general parts department. Some parts will be carried naturally in the repairshop, but fenders, tops, wheels, etc., would be carried on this floor. Each car would have its own parts department, to facilitate matters. In front of the elevators could be placed a general tire sales counter, while the tire repair department takes in the central portion of the floor. The accounting department, where records are kept, bills made out, correspondence attended to, etc., is at the forward end of this floor.

#### Work Steady

Finally, a telephone switchboard operator and information desk would be placed in the entrance with comfortable chairs and settees for persons waiting for their cars. Direct telephone communication could be established to all departments and if a salesman wishes, for instance, to dictate a letter, the switchboard operator calls the business department for a girl. Thus a few girls could do the stenographic work for the dozen or so dealers, while under present conditions each dealer must employ a stenographer, who may or may not be busy all the time. What is true of the stenographer is true of other employees. There would be work for all all the time.

## What a Kansas Dealer Thinks of the Co-operative Idea

THAT the co-operative motor car retail establishment outlined by MOTOR AGE already has its advocates in the trade is evident. Co-operative motor car retail establishments also are suggested by Fred Langley, president of the West Motor Car Co., Topeka, Kan., which sells Studebaker and Chevrolet cars and also handles Avery tractors as well as a line of tractor plows, threshing machines and other apparatus to go with the tractor.

The shortage of man power in the repair and maintenance departments of the dealers and garages in many cities is the reason why Mr. Langley sees the co-operative idea as not only a possibility but perhaps a necessity in these days of shortage of man power. His conception on the matter is as follows:

In a city such as Topeka, where there are a dozen or more different motor car dealers and many garages, it is impossible to maintain expert workers in all of these different departments. Each place is not able to have an expert electrician familiar with all kinds of starting, lighting and ignition apparatus. It is impossible to maintain an expert welder and an expert repairer in different lines. The overhead in all of these separate departments is also high.

Mr. Langley sees in the co-operative

scheme perhaps a four-, six- or eight-story building which would occupy perhaps a quarter or half of a city block. This would serve for selling a dozen or more different makes of cars, trucks and tractors and also allow a complete service system for all of these. On the ground floor there could be a dozen or more different salesrooms for the different makes of apparatus with a salesman in charge of each. There would be but one telephone exchange or telephone attendant instead of several; there would be one accounting department for the dozen or score of salesrooms and practically one overhead for all of them.

In such a co-operative institution there would be great service facilities on the upper floors. It would be possible to have one of the most efficient electrical departments in the state, one of the best battery experts could be obtained and a good battery department fitted.

There could be a competent body-building department which would care for all of the different lines of vehicles handled in the work. One huge stockroom, properly organized and equipped, would serve for the entire line and a better service could be had because of the capacity of it.

With such an organization one of the ground floor stores could be a supply house

which would carry a complete line of accessories instead of having such a line divided up among twelve different organizations, none of which would make much money.

There are other cities where the difficulty of securing adequate and efficient help for electrical work is such that three or four repairshops are already discussing the feasibility of uniting into one larger organization or having one of their places handle all of the electrical work.

These many signs of the times brought about by war conditions indicate how necessary it is for repairshops, service buildings, etc., to keep alive to the situation and look ahead with the thought of adapting business to the needs created by the war.

This scheme of combination has taken very largely among manufacturers but as yet has not set in among concerns engaged in motor car maintenance and service. Some of our largest manufacturing organizations are the result of combining a dozen or more small concerns and the efficiency that has resulted is one of the best recommends as to the advisability of the move. It may be that very increased efficiency can come from combinations of repairshops, garages and service organizations.

# The Why of the Gasoline-less Sundays

## Conditions Surrounding Restriction on Motoring One Day a Week

**S**ENATOR LODGE'S resolution calling upon the Fuel Administration for information as to the reason for gasolineless Sundays echoes the queries of the industry. The American motor industry has begun to wonder just exactly what were the reasons that led to this request and second, just why it was confined to a specified territory.

It is not unnatural that such questions should arise in view of previously published statements by the head of the Fuel Administration and others who should know the exact conditions that there was no immediate shortage in prospect, even though in the same breath they counseled conservation. Also the territorial limitation of the ban on Sunday gasoline might not at first thought seem logical in view of the fact that motor cars west of the Mississippi could not be assumed to be more economical than those operating in the East.

Strange as it may seem, the available supply of gasoline is now not so greater under the demand than it was at the same period last year, but the proportion of the supply which is needed for war purposes, and particularly the proportion needed by the Allies in Europe, is very much greater than it was at this time last year. Production as a whole has not kept up with the total demand for the last few months, so that the stocks of gasoline in storage have decreased, but this decrease is not greatly above normal for this time of year. But the stocks of gasoline at the Atlantic seaboard shipping points which are held for shipment to Europe are low. This has come about because transportation facilities from the producing centers to the Atlantic ports have not been able to keep up with the demand for fuel on the war front without decreasing their carrying capacity of other needed war supplies.

### Stock on Hand

According to the figures issued last month by the Bureau of Mines the stock of gasoline on hand on June 30 was 418,440,353 gal., as against a stock of 460,637,479 gal. at the end of May. The total of April 30 was still larger, being 509,197,134 gal. Taking the season and the additional demand into consideration, these stock figures are perfectly normal. Production of crude oil has dropped slightly, the June figures being 28,140,479, as against 28,510,698 gal. during May.

Thus by asking motorists east of the Mississippi, that is, the territory to which gasoline must be shipped, to abstain from using gasoline one day a week, it becomes possible to utilize the transportation space for trans-Atlantic gasoline which normally they would require for their Sunday consumption. The occasion for the appeal to stop use of gasoline on Sunday, therefore, is chiefly a transportation problem.

Incidentally this curtailment in the use of gasoline does help greatly to increase the available supply in storage throughout the country and thus again build up the reserve which must be maintained not only at the

seaboard but also throughout the country if the nation is to be sure of having sufficient for emergency needs.

That the Government demands for gasoline are tremendous can be realized from the following facts. Here are some of the requirements:

Five times as much gasoline was used on the western battle front during the month of April as had been used in the preceding January.

Government needs 1,000,000 bbl. of Navy specification gasoline for overseas shipment in the next three months.

To offset the heavy drafts made on the supply, western refiners must furnish about

250,000 bbl. of petroleum a month during September, October and November for export by way of the Gulf.

The National Petroleum War Service Committee is allotting to each refining district the proportion of future needs of gasoline, aviation naphtha and kerosene it must turn out and a special arrangement is made by way of additional pipe line facilities to enable more Mid-Continent crude petroleum to be furnished to refining plants along the seaboard.

Plants on the Atlantic and Gulf seaboard must furnish larger amounts than would proportionately be their share because of a shortage of tank cars and also because of limited facilities for storage at the port terminal.

Ninety per cent of the estimated total requirement of kerosene, 75 per cent of gasoline and 66 per cent of aviation naphtha, are assigned to the seaboard plants under this plan. The balance of the requirements are to be furnished by interior refiners. This rearrangement of production by which export needs are taken care of near the seaboard should relieve the transportation situation in time materially.

While it is possible it is hardly probable that the territory west of the Mississippi will be called on to cut out Sunday use of gasoline. The western refiners and jobbers feel that their territory should be taken care of under the present conditions; however, it is expected that California undoubtedly will be called upon to supply fuel oil and gasoline for the Allied-Siberian expedition and it will be necessary to meet this and other demands that industries to whom fuel oil can be supplied be further limited.

### What Bedford Says

Just what this restriction of Sunday motoring means to the war supply of gasoline was brought out most forcibly by A. C. Bedford, chairman, National Petroleum War Service Committee in an article in the Oil Industry Supplement of the New York Evening Post. A part of Mr. Bedford's statement follows:

Until recently there had been no effort whatever to curtail the use by domestic consumers of gasoline or any other petroleum product for any legitimate use. The appeal issued by Mr. Requa, Director-General of the Oil Division of the Fuel Administration, this week requesting the public to refrain from the use of motor vehicles, particularly passenger cars for pleasure riding, on Sundays, was the first attempt to make any change whatever in the ordinary habits of the public in the use of gasoline or any other petroleum product.

Even this situation is abnormal, and but for an unusual conjunction of events could have been avoided. Several things have happened very close together, making this step, which it is still believed will be only temporary, an act of prudence.

The scale of operations on the western front has, of course, been of extraordinary magnitude for the last four or five months. That scale has been increasing. And oil is a very neces-

(Concluded on page 15)

## Stop the Leaks

**W**HETHER or not the proposed Senate investigation of the reason for gasless Sundays shows that the request was needed, there still remains the patriotic necessity for all motor users to watch very carefully against wastage of gasoline. This wastage should be watched whether it be through uneconomical operation of the car or through the useless consumption of gasoline.

It is just as unpatriotic to consume the gasoline in useless trips on week days as it is on Sundays, although there is not the stigma attached to it. It is just as unpatriotic to consume gasoline in useless motoring as it is to let it run on the ground through leaks or spilling.

Above all, watch against the loss of gasoline that should go into the running of your car. The Fuel Administration asks that you save gasoline in the following ways aside from the gasless Sundays:

Don't spill any.  
Don't permit leaks.  
Don't use for washing.  
Don't run engine while standing.  
Don't leave tanks or can open.  
Don't waste lubricating oil.  
We might add: Don't use too rich a mixture and don't let brakes drag.

## Gasless Day Quiz

Washington, Sept. 10—Special telegram—Fuel Administrator Garfield expects soon to fix a price for gasoline for domestic consumers as well as the Government and Allies. Definite action will be taken after further reports on the investigation.

This follows a request from the Senate for information on the gasoline situation. It is said that there is a growing suspicion that the gasoline-less Sundays are not necessary but create an impression of a shortage, justifying higher prices. The Federal Trade Commission denies a shortage, and it is reported the fuel administrator personally did not favor the plan.

A demand for an investigation is expected from the Senate if the reply to its request for information verifies these reports.



# Over the Top in Service and Repairs

## Converting War-Day Failures Into War-Time Success

### Article IV—System in the Shop

By T. P. Bowman

RECORDS and system are so closely related that either is incomplete without the other. Records lend the foundation to your system and system keeps a watchful eye to see that all records are kept in force and accurately carried out.

System says, "I want an accurate account of every transaction for the entire day," and Records, if employed, will render the exact information required by System.

The repairshop which has never employed system and records undoubtedly is inclined to regard them as an unnecessary allotment of red tape, and if I know of a repairshop which regards them as such I also know that that very business place is a hit-and-miss proposition from a service as well as a financial standpoint.

#### Absence of System

The absence of system has made a large field for the manufacturers of red ink, and if any of our readers have not taken advantage of the previous articles in this series it is safe to say that some of our readers are flirting with the red ink bottle and are apt to find themselves on the wrong side of the ledger at a moment's notice.

There can be no greater encouragement for you to begin, to begin right now, than the evidences of success displayed by each and all of the prosperous concerns of the present day. Try as you may, you cannot find one progressive concern doing business and at the same time not knowing what they are doing. You may find a concern, but not a prosperous one. You may look at your own, for instance. Is your business all that it ought to be, or is it on a balance pending a change of the wind to throw it on the right or wrong side? Sum up its

condition and compare the result to the amount of system involved. You will find they compare very closely.

The repair order, or shop order, as it is commonly termed, is the first to be treated. Fig. 1 is probably the most popular and complete of all the different forms in use. This repair order is made in triplicate, the original being of light-weight paper suitable for pencil writing—the duplicate being of the same grade of paper, but generally of a different color, so that it readily may be distinguished from the original and the triplicate, which is of a medium-weight cardboard.

Fig. 2 shows the outline for the back side of the original and the duplicate.

Fig. 3 shows the outline for the back side of the triplicate or the cardboard copy.

The following example completely explains the use of the triplicate repair order:

William Black's car is brought to the repairshop for a rear axle overhauling. This work is undoubtedly determined after a thorough inspection by the shop foreman. The foreman or the shop superintendent prepares to write the repair order by inserting a sheet of carbon paper between the triplicate, or cardboard, and the duplicate and another between the duplicate and the original. He then commences by writing the owner's name, address and telephone number. The job number generally is printed on the order by the printer, and in this event it is unnecessary to write it. The hour the car was received is next recorded and then the name of car, engine, number and license number. Under the heading of

Instructions the work to be performed should be recorded.

Before proceeding let me explain the importance of all this data.

The customer's name is of the first importance, be it cash or charge. You should never do a job without having a record of the owner's name.

The importance of the address lies in the fact that you are constantly building a very accurate mailing list of your customers which is very valuable, especially when you want to reach your customer by personal letter or want to place any special announcements in their hands.

#### Advantage of Records

Suppose that while overhauling William Black's car it was discovered that the front wheel bearings required attention and upon referring to the repair order you had Mr. Black's authority to overhaul the rear axle only. It is not advisable to let the front wheel bearings or any other irregularity pass unnoticed while the car is in the shop and it is not advisable to make further repairs without the owner's permission. So the proper step to take is to communicate with Mr. Black, by telephone if he has one, notifying him of the additional work which ought to be done, either obtaining his permission to proceed with it or his order to let it go untouched. In this way the customer cannot call for his car and complain of work having been done which was not ordered or complain of certain irregularities being overlooked which ought to have been repaired.

The hour received, started, finished and promised are an interesting record for the shop superintendent and the manager as well. Through this record, small as it may seem, the manager can check the judgment of the shop superintendent or foreman, as well as the efficiency of the shop. The greatest advertisement any repairshop can place before the public is a reputation of delivering the job on time, and this record gives an accurate account of the percentage of jobs delivered on time and those which were late. If attention is paid to this part of the repair order, you have at all times an accurate account of the efficiency of your service department.

The make of car, engine number and license number in many instances have been responsible for the recovery of stolen cars

NAME	Wm Black	JOB	1070	DATE	9-7-18
ADDRESS	500 Broadway	REC'D	1:00 P.M.	CAR	
PHONE	Main 7200	STARTED	1:30 "	ENGINE	287841
WORKMAN	5	FINISHED	4:20 "	LICENSE	Del. 4873
		PROMISED	6:00 "		
INSTRUCTIONS					
Overhaul Rear Axle					

Fig. 1—The repair, or shop, order, which is made in triplicate



JOB 1020		9-7-18
ITEMS		
1	Drive Pinion	
1	Arle Shaft	
1	Drive Shaft	
1	Universal Joint	
3	# Grease	
WORKMAN <i>Brown</i>		O.K. <i>Jones</i> FOREMAN

NO.	ITEMS
1	Deer Pinion
1	Arctic Sheep
1	Deer Sheep
1	Universal Joint
3	# Grease

Fig. 4, above—This is the form on which the workman lists needed parts

Fig. 2, left—Back side of the original and the duplicate as O. K'd by the foreman

where a record of stolen cars has been kept for reference.

The distribution of these triplicate repair orders is as follows:

The original is delivered to the keeper of the parts department. The duplicate is retained by the shop superintendent and the cardboard copy then is placed with the car.

### Disposing of Job

In the way of disposing of this job the foreman places workman No. 5 at work on it. Workman No. 5 writes in the hour, Fig. 3, reads the instructions and proceeds. After having taken the rear axle apart he finds that he requires several parts, which he lists on form 4. This order for parts is taken to the foreman, who places his O. K. on it, copies it on the back of the duplicate order and sends it to the parts department to be filled. The keeper of the parts department delivers the parts to the bearer immediately and later copies the order on the back side of the original. When the job is completed the workman notes the time, Fig. 3, and delivers the card to the foreman, who sends the card and duplicate to the parts department. The keeper of the parts department compares the parts listed by the foreman on the duplicate with the parts listed on the original and if they compare the original and the card are fastened together and filed away. It is practically im-

[illegible]

*Fig. 3—Back side of the triplicate, or cardboard copy*

possible to overlook the charging of a part to a customer if this method is carried out.

get settled in his new venture and all of that, but we will not supply men to do work that he should pay for.

"We do maintain an inspection service to ward off damage to the trucks. We ask truck owners to send their trucks here for inspection, and if they do not, we send out to inspect them. This is only self-protection. It does not take long to educate the truck owner to send his truck in here. If we find a leaking crankcase or a truck that has not been brought here for inspection, we point out that a few days more and the owner would have lost the service of that truck until repairs were made, beside having a big bill of repair costs.

"In our inspections we make it plain to the driver when and where he has been at fault. We show him the minor adjustments that he should detect and where he has forgotten to use oil.

"We do this with a hope of educating the driver and if he is a good driver we succeed in interesting and educating him and stirring his pride in his truck.

"If he is one of these 'reckless guys' we try to bring him to a realization of his pay envelope. If he does not, eventually, show any sign of improvement, we make an inspection report to the owner of the truck and try to get a man on the truck who will endeavor to keep it on the road.

"The truck dealer who is going to give good service on trucks must have a fair schedule of prices, an efficient inspector and first, last and all times, he must not promise too much.

"Keep the driver and the salesman in line, and there will not be much trouble. There are, of course, exceptions to all rules. Sometimes we get a truck out that is a bad actor. Then we keep close watch on it and with frequent inspections and adjustments, we soon eliminate the trouble."

## DIRECTOR OF TANKS APPOINTED

Washington, Sept. 6—Louis J. Horowitz, formerly president of the Thompson Starrrett Construction Co., New York, has been appointed assistant chief of ordnance, in charge of tanks. Mr. Horowitz will have complete authority on the engineering, manufacturing and inspection of tanks.

Brig.-Gen. J. T. Thompson, U. S. A., retired, has been made director of ordnance training and will work out the types of training to be given Ordnance personnel.

## Service Trouble Versus Driver Trouble

### Educating the Operator Pays

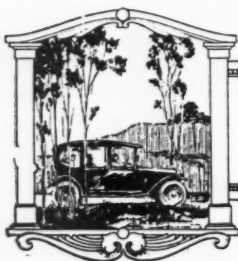
**S**T. LOUIS, Sept. 6—"The new truck dealer should realize from the start that service trouble is 75 per cent driver trouble," says W. E. Rehbein, manager of the Garford branch here.

"The truck business, unlike the passenger car business, has never been greatly troubled by over-promises as to service, and the motor car dealer who is going to sell trucks this winter should keep in mind that no free service can be promised.

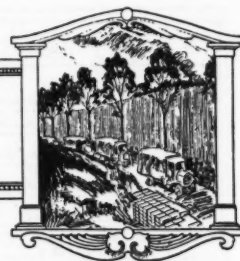
"A radical difference between passenger cars and trucks are that trucks are sold to and are handled by business men. A free service promise to them arouses suspicion. If so much can be given, the price

must be too high. They will ask a reduction in price and express a willingness to pay for service. That is perfectly reasonable and cannot be answered in any way except by accepting it. So don't promise them anything except minor adjustments and inspection.

"The buyer of a truck through this branch understands perfectly that we are not going to keep that truck in repair for him. He also understands that we have sold him transportation for his goods and that we will do anything within reason to make that transportation profitable to him. We will take care, free of cost, of any structural defects. We will help him to



# EDITORIAL



## From Distribution to Service

WITH passenger cars threatening to be practically off the market so far as new sales are concerned, it seems that the selling end of the passenger industry must turn its attention, as it is turning it, to related though slightly different lines. The activities of what formerly has been the distribution end of the industry must be concentrated on the equally important end of service or else turn to the distribution of such other automotive products as are considered more essential and consequently are available for sale.

THIS means that the motor car dealer must, if he is to remain in the industry, turn his attention to service on cars now in the hands of owners, and secondly, to distribution and service on such related lines as motor trucks, tractors, house lighting outfits, etc. Steadily increasing numbers of dealers are making these moves. Those who are not looking into the future on this score are closing their eyes to the inevitable. The dealer of the future wartime days will be one who has turned from distribution of cars to service and related lines.

## Size of Farm and Tractor

AN experienced tractor salesman says that the economy of the tractor on the farm of from 100 to 160 acres is determined quite as much by the distance of the farm from the nearest market town as by any other one factor. This idea has the virtue of novelty at any rate, but it appears to be worthy of consideration for other reasons.

THIS particular salesman explains his theory as follows: The determining factor is that of hauling. The farm two, three or four miles from town can be served with a single team because the trips are short and can be made frequently and with little expenditure of time. A substitution of tractor for horses down to the minimum necessary for hauling can be made advantageously and economically upon such nearby farms.

AS the distance of the farm from the town increases the number of horses required for the necessary hauling increases likewise, until the point is reached where the number of horses required cannot be reduced by the presence of a tractor. In this case, the latter, despite its efficiency in other respects, becomes just an addition to the power equipment of the farm without compensating advantages. The value in this case is decreased by the distance.

WHEN the farm is above quarter section size the effects of distance are not as marked, and by the time 240 acres are reached it has lost its effect altogether. On farms of this size the tractor always can justify itself economically regardless of distance or any other modifying factor.

PLAUSIBILITY is lent to this theory by the fact that experience in horse displacement by tractors shows a much larger proportion of the normal horse equipment displaced on large farms than on small. As long as road hauling is a function of horses there is an irreducible minimum of horse equipment necessary, and this is reached sooner on the small farm than on the large. This irreducible minimum is markedly affected by distance as well, and the small farm lying at a considerable distance from town is at a decided disadvantage for this reason.

THE dealer well can afford to take such theories into account when he is considering the relative value of tractor prospects. In working a territory the dealer cannot afford to waste time on bare possibilities when actual probabilities lie closer at hand. If, as this salesman believes, distance from market and small size of farm reduce sales possibilities, and the theory seems to be reasonable enough, then this fact should be given due weight when the sales campaign is planned.

## The Fortunes of War

THE action taken at the monthly meeting of the board of directors of the National Automobile Chamber of Commerce to abandon the national shows during the war "to further cooperate with the governmental authorities in conserving labor, fuel and transportation" is an example of patriotism, because the N. A. C. C. felt that the holding of shows would be inconsistent with the patriotic obligations of the industry and, hence, resolved not to hold them. Just whether the rest of the country as a whole will follow the lead of the N. A. C. C. it is most too early to predict. At all events there will not be as many shows this year as in previous years, and these will be automotive for the most part.

AMERICA'S first motor car show was held in Madison Square Garden in New York during the week of Nov. 3, 1900, and was followed almost immediately by the first annual show in Chicago. An oval track surrounded the arena on the main floor of the Garden, and here cars were demonstrated to prove to the

skeptical public that they really could run. Rising high above the roof of the Garden was a plank incline with a steep gradient on which the hill-climbing ability of the little steamers of that period was demonstrated. Steam vehicles predominated at that show and for several years thereafter with electric second and gasoline vehicles a bad third. This was eighteen years ago, and this year for the first time the exhibitions which have drawn tens of thousands to the Grand Central Palace in New York and the Coliseum and First Regiment Armory in Chicago will not be held. The fortunes of war!

THE first National show at Chicago was held the week of March 23, 1901. Eighteen vehicles were entered for exhibition, and a track 20 ft. wide and about ten laps to the mile was constructed for a filler. The track inclosed the main exhibit floor and was reached by a stairway bridge at each end over the track and from the balcony. Along the east, north and south walls of the Coliseum were stands of parts, accessories and sup-



plies. A racing machine had two sets of rollers on each of which the motor car rolled. Between front ones a dial was set, and each circuit of the dial represented  $\frac{1}{4}$  mile. The record was a mile in 57 sec. Four thousand persons attended the opening night. Since then Chicago has become the lodestone for dealers and other representatives of the industry at its shows, more than 3000 dealers having attended last year. Just as New York has grown from a total of ninety-three exhibitors in November, 1901, its second show, to 355 exhibitors at the last exhibition.

## Every Dealer and Garageman Can Help the Nation and Help Himself

**A**NNOUNCEMENT of a plan in which under an organized method the coöperation of every employer is requested in order to help in the promotion of the Fourth Liberty Loan appears on pages 82 and 83 of this issue. That announcement is worthy of your careful and immediate attention and action. It is certainly not difficult to see how the energetic carrying out of this plan may produce results helpful not only to the Liberty Loan but to American business.

**T**HE tremendous impetus which Charles M. Schwab has given to shipbuilding has been largely achieved by making every individual engaged in the industry feel a personal responsibility for results and a personal pride in helping to make great results possible. This spirit of accomplishment in the ship-building industry has been brought about by the leaders—the employers—the bosses; whatever you choose to call them; making it a business to come in personal contact with the workers and to inspire and enthuse the men with a sense of the importance of their work for victory in the war—a sense of personal responsibility, and a spirit of teamwork.

**T**HE creation of that spirit among the workers of the nation in all lines of activity would be of incalculable benefit to the workers themselves, to employers, and to the nation. Concretely two of these results would be:

1. To quicken and increase the response to all war measures such as Liberty Loans—War Saving Stamps—the draft—food and fuel saving.
2. It would make the worker feel more keenly his responsibility to do his work (no matter what its character) to the very best of his ability. Make him feel the necessity of sticking closely to his job.

## The Why of the Gasoline-less Sundays

sary factor in these operations. Five times as much gasoline was used on the western front during the month of April as had been used in the preceding January.

In addition to the probable 5,000,000 passenger automobiles in the United States on the first of January of this year, there has been a tremendous growth in the output this year. Owing to the fact that weather conditions were so favorable, and the supply of gasoline was so free, the people have used their motor cars without restriction throughout the summer. This fact has produced a peculiarly acute demand, which is just now reaching its highest point.

All these factors made it necessary that the Oil Division of the Fuel Administration, which has always acted in cooperation with the National Petroleum War Service Committee, should take no chances lest a continuance of existing conditions during the next month might produce an actual shortage of petroleum products for war necessities.

That is the occasion for the appeal to stop pleasure riding on Sundays. There is no question that the public will patriotically comply with this appeal, and the result will undoubtedly be that the "peak-load" of this year's demand

will be gotten over successfully. And it is to be expected that within a reasonably short time the free and unrestricted use of gasoline and all other petroleum products may be resumed.

Observance of the second gasless Sunday seems to have been more thorough even than was that of the first one. This came about through the more general understanding of the spirit of the request and the awakening of the public conscience of the motor public in general. In some cities such as Detroit, New York, and Washington, reports indicate that the construction of the request was much more strictly interpreted than it was the first Sunday.

Aside from the conservation of gasoline which was the object of the request it develops that thousands of tires were saved.

### Saving Thousands of Tires, Too

Boston, Mass., Sept. 7—Manager Fred T. Moore, in charge of the New England branch of the B. F. Goodrich Co., did some

**T**HE fortunes of war have halted the holding of these two great shows; they may prevent most of the local shows—that is unsettled. But at any rate, just as the N. A. C. C. yielded to the need of the hour, so will it be with the rest of the country. In the words of the National Association of Show Managers, which represents practically every important local show, there will be no shows unless they have the full approval of those who are running the country's industrial war machine. The industry is 100 per cent patriotic clear through.

**E**MPLOYERS generally should pursue with intelligent enthusiasm the plan of "Win-the-War" meetings proposed as a means to aiding the rapid flotation of the Fourth Liberty Loan. The results of such action will not only be helpful in the loan drive, they will be permanently helpful to the nation through the development of a keener realization by the worker of the importance and dignity of his individual job and the necessity for personal responsibility and helpful team-work.

**E**VERY employer can be a leader and a center of influence in this work. The dealer or garage man who operates a small business with relatively few employees may feel that his circle of influence is too small to be worthy of any effort. That is a mistake. It is the aggregate that counts, as the announcement of the plan very clearly points out.

**T**HE man who is in a relatively small circle may not hold so pretentious a meeting—it may not be formal or run under parliamentary rules—it may not be especially announced, or accompanied by music and oratory. But the man who will quietly call a few of his men around him and informally, thoughtfully, lead discussion into win-the-war channels, pointing out the importance to the individual of doing his best in support of Liberty Loans and all other war activities, can do a real service in this way. It can be so well done in no other way. And ten thousand such little meetings would produce an enormous aggregate result.

**W**HETHER his opportunity be great or small every American business man should carry out this idea in a definite systematic manner. The "Program" booklet which is mentioned in the announcement will be found tremendously helpful in its suggestions as to what should be done under any circumstances.

figuring the other day following the stopping of motor riding on Sunday, to show how many tires were saved as well as gasoline on the first day. Mr. Moore figured that because it was the Sunday preceding Labor Day, and the weather was so ideal generally, that about everyone who owned a car would have it in use. So he got the registration figures showing that east of the Mississippi river there were some 2,885,061 passenger cars registered, after he deducted 1 per cent for cars used in emergency errands. Then allowing an average of 75 miles per car he got 216,379,575 miles. Giving the average life of a cord tire as 8000 miles and a fabric as 5000, it meant that keeping cars in the garages saved 43,236 fabrics and 27,023 cords, or a total of 70,259 tires. As there are more than 10 lb. of rubber in the average tire it would represent a saving of more than 700,000 lb., or some 350 tons of rubber, and perhaps about 100 tons of fabric.



# War Board Revises the Preference List

## Four Groups Come First in Fuel, Labor, Material and Transportation

WASHINGTON, Sept. 7—Seventy-four separate industries are named in a new preference list just issued by the War Industries Board as the primary industries of the nation, entitled to preferential treatment because of war or national interest requirements. These industries, together with 6500 individual plants engaged in part or whole on war work, which could not be classed with general industries, will receive preferential treatment in fuel, labor, capital, materials and transportation requirements. The list will also be used by the War Department to determine draft exemptions for industrial reasons.

The industries are listed in four groups, group No. 1 being the most important. Intrinsic importance of the product during the war, need for maintaining or stimulating the production and the proportion of the industry or plant devoted to war work are the three factors that determined the list. The 6500 plants to be listed individually have not been determined finally, and this list will be published later.

### Automotive Interest

Those industries named in the list and of special interest from an automotive viewpoint include the following, the Roman numerals indicating the group:

Aircraft—I.

Ammunition—I.

Small arms—I.

Blast furnaces producing pig iron—I.

Brass and copper plants engaged principally in rolling and drawing copper, brass and other copper alloys in the form of sheets, rods, wire and tubes—II.

Chain plants manufacturing principally iron and steel chains—III.

Chemicals—Plants making chemicals for aircraft and other war needs—I.

Chemicals—Other chemical plants—IV.

Coke—Plants engaged in producing metallurgical coke and by-products including tolul—I.

Coke—Plants not otherwise classified and listed, producing same—II.

Electrical equipment—Plants engaged principally in manufacturing same—III.

Farm implements—Plants engaged principally in making farm-operating equipment and agricultural implements—IV.

Ferr-alloys—Plants engaged principally in producing ferro-chrome, ferro-manganese, ferro-molybdenum, ferro-silicon, ferrotungsten, ferro-uranium, ferro-vanadium and ferro-zirconium—II.

Machine tools—Plants engaged principally in manufacturing same—II.

Mines—Coal—I.

Mines—Producing metals and ferro-alloy minerals—II.

Mines—Plants engaged principally in making mining tools and equipment—III.

Oil and Gas—Plants engaged principally in producing oil and natural gas for fuel, or for mechanical purposes, including refining or manufacturing oil for fuel or for mechanical purposes—I.

Oil and Gas—Pipe lines and pumping sta-

tions engaged in transporting oil and natural gas—I.

Oil and Gas—Plants engaged principally in manufacturing equipment or supplies for producing or transporting oil or natural gas or for refining and manufacturing oil for fuel or for mechanical purposes—III.

Steel making furnaces—Plants engaged solely in manufacturing ingots and steel castings by the open hearth, Bessemer, crucible or electric furnace process, including blooming mills, billet mills and slabbing mills for same—I.

Steel plate mills—I.

Steel—All plants operating steel rolling and drawing mills exclusive of those taking higher classification—III.

Tanners and tanning—All plants engaged principally in tanning leather or in manufacturing tanning extracts—IV.

Textiles—Plants engaged principally in making textile machinery, cotton or woolen textiles, or cotton or woolen knit goods—IV.

Tools—Plants engaged principally in making small or hand tools for working wood or metal—III.

Tin plates—Plants engaged principally in manufacturing same—III.

The term "engaged principally" means 75 per cent of the product mentioned. In other words, a concern must be devoting at least 75 per cent of its resources to the manufacture of the product named to secure preference.

This new list, compiled by the Priorities Division of the War Industries Board in co-operation with the Railroad Administration, Shipping Board, War Trade Board, Food Administration, Fuel Administration, War Department, Navy Department, Allied Purchasing Commission and War Labor Policies Board, supersedes all previous lists.

In numerous instances individual plants have been found entitled to high preference while the industry to which they belong is not and in consequence the list of individual plants is being compiled insofar as is necessary.

It is expected that motor truck factories, having preference treatment for motor truck manufacture, will be named individually.

Requirements of industries and plants grouped under class II, III and IV, says the official statement, will have precedence over those not appearing on the preference list. As between these classes, however, there will be no complete or absolute preference, the division being to present a composite picture of the relative importance of the industries and plants embraced in each group. It is not intended that the requirements of class II shall be fully satisfied before supplying any of the needs of class III or that those of class III will be fully satisfied before supplying any of those of class IV. The classification, however, does indicate that the industries and plants grouped in class II are relatively more important than those in class III, though again a particular industry may be listed

higher because its production is not equal to the demand while a more important industry may receive lower rating because it is able to meet the demand without the higher classification.

Following the publication of the list of individual plants, each plant will be expected to file a report not later than the 15th of each month, with the secretary of the Priorities Board, covering its activities during the preceding month. Failure to submit the report will cause such plant to be dropped from the preference list.

## Price Increases

Wichita, Kan., Sept. 9—The price of the Jones six seven-passenger, model 27B, was advanced from \$1,875 to \$2,100 Sept. 1. Several minor refinements, such as Johnston glass in the curtains, have been added. The sport model, a four-passenger, in optional colors, is listed at \$2,350.

Kenosha, Wis., Sept. 9—The Nash Motor Co. has made the following price changes, effective Sept. 1.

MODEL	OLD PRICE	NEW PRICE
681 5-passenger .....	\$1,395	\$1,490
682 7-passenger .....	1,545	1,640
683 4-passenger roadster.....	1,395	1,490
686 6-passenger sedan.....	2,085	2,250
685 four-passenger coupe.....	2,085	2,250
2018 1-ton chassis.....	1,595	1,650
3018 2-ton chassis.....	2,075	2,175

The Nash Quad chassis, model 4018, remains \$3,250.

Detroit, Sept. 6—The Cadillac Motor Co. has advanced its prices \$300 on the following models, effective Sept. 1:

MODEL	NEW PRICE
Touring .....	\$3,520
Phaeton .....	3,520
Roadster .....	3,520
Brougham .....	4,390
Suburban .....	4,640
Limousine .....	4,695
Landulet .....	4,795
Town limousine.....	4,660
Town landulet.....	4,810

These prices are f.o.b. Detroit and do not include war tax.

Toledo, Ohio, Sept. 6—Willys-Overland has increased the prices of all its models, effective Sept. 1, as follows:

MODEL	OLD PRICE	NEW PRICE
90 (T) touring.....	\$ 895	\$1,095
90 (R) roadster.....	895	1,095
90 country club.....	925	1,145
90 Sedan .....	1,385	1,665
90 panel delivery.....	895	1,045
90 express delivery.....	875	1,025
1200-lb. express delivery.....	1,075	1,150
1200-lb. special panel delivery.....	1,075	1,150
85-4 touring .....	1,025	1,175
85-4 roadster .....	1,025	1,175
85-6 touring .....	1,300	1,495
85-6 roadster .....	1,300	1,495
85-6 coupe .....	1,550	1,750
85-6 sedan .....	1,720	1,920
89-6 touring .....	1,525	1,775
89-6 club roadster.....	1,525	1,775
84-4 touring .....	1,650	1,925
88-4 coupe .....	2,800	2,850
88-4 sedan .....	2,650	2,950
88-8 touring .....	2,500	2,750
88-8 coupe .....	3,175	3,425
88-8 sedan .....	3,200	3,475
88-8 limousine .....	3,300	3,500

## TIRE ECONOMY CONFERENCE

Chicago, Sept. 9—The Automobile Tire Economy Conference has been called for Sept. 15-18 at the Congress Hotel here to form the National Association of Standard Tire Filler Manufacturers and to submit to Government bureaus a wartime program

for salvaging motor tires. Facts looking toward economies in the upkeep of motor vehicles will be submitted and discussed.

The tire filler manufacturers listed by the conference are the Essenkay Products Co., Chicago; Peerless Tire Filler Co., Chicago; Dahl Punctureless Tire Co., Minneapolis, Minn.; Pan-American Rubber Co., Milwaukee, Wis.; National Rubber Filler Co., Midlothian, Tex.; Panama Rubber & Equipment Co.; Wolverine Tire Cushion & Accessory Co., Detroit; RubberAir, Inc., New York; Bettern-Air Co., Philadelphia, Pa.; National Synthetic Tire & Rubber Co., New York; Universal Tire Filler Co., Portland, Ore.; and National Tire Cushion Co., Kansas City, Mo.

### CAR TAX IS TREBLED

Washington, Sept. 6—The new revenue bill presented to the House by the Ways and Means Committee more than trebles the manufacturer's tax on passenger cars and nearly doubles the tax on motor trucks. The tax on the sale price is put at 10 per cent and the levy on trucks and accessories at 5 per cent. In addition there is a provision to tax the owners of passenger cars on a horsepower basis as follows:

Up to 23 hp.....	\$10
23 to 30 hp.....	20
30 to 40 hp.....	40
Over 40 hp.....	50
Motorcycles .....	5

Electric passenger cars are taxed \$5 a horsepower and 50 cents for each 100 lb. of weight in the bill. At the last moment the committee added a tax on the gross receipts of sight-seeing cars and taxicab companies, proprietors of sight-seeing cars to pay 10 per cent of the gross receipts, taxicab companies operating three or more cars to pay 5 per cent of the gross receipts.

## Effect of N. A. C. C. Action on Shows

### Local Situation Unsettled as Result

NEW YORK, Sept. 7—Just what effect the abandonment of the National shows will have on the dealer shows such, for example, as Kansas City, Minneapolis, etc., is not known, though Boston already has declared that its show also will be delayed until after the war. The National Association of Show Managers, representing practically every important local show, says:

#### What Is Said

"It is not possible at this time to state exactly what will happen in regard to the dealer shows although the probability is that there will not be the number held in previous years. Passenger car exhibitors are, of course, hardly to be considered; however, there are so many other automotive activities in certain sections, especially in the large agricultural centers, that the exhibition situation of next winter can hardly be foretold. One thing is assured, and that is that there will be no shows unless they have the full approval of those who are running the country's industrial war machine."

Local shows yearly have meant much.

## Jobbers Drop Show from Convention

### Automotive Accessories Display in Chicago May Be Last Exhibition

CHICAGO, Sept. 9—The National Association of Automobile Accessory Jobbers has decided not to hold its show, which was scheduled for the week of Oct. 28-Nov. 2, at the Medinah Temple. The reasons for calling off the exhibition are the same as those given by the National Automobile Chamber of Commerce for calling off the National shows this year, as reported in MOTOR AGE last week. The need of conserving all efforts for the successful prosecution of the war and particularly the inadvisability of diverting transportation capacity from direct war needs were the moving factors in the decision. It is probable that the annual convention of the N. A. A. J., which is to be held at the same time, will be carried through with the show feature eliminated. This decision was announced in a bulletin sent to all members Saturday by Commissioner Webster.

Abandonment of the National motor car shows at New York and Chicago and the jobbers' show leaves the exhibition at the Municipal Pier, Chicago, known as the Automotive and Accessories Exposition, the second annual, which last year was the National Exposition for Ford Accessories, as the last and only event of the kind on the calendar. This exhibit, which opens Saturday, Sept. 14, and runs until the following Saturday, has a good list of exhibitors, particularly of accessories. In addition there are a number of tractor, truck, truck-former and parts manufacturers who are among the list of exhibitors. Passenger car exhibits will be only incidental.

It is probable that the pier show will benefit somewhat by the discontinuance of plans for the jobbers' exposition, because there undoubtedly are several jobbers who will take space in the pier show, now that the one at the Temple is not to be staged. Reservations of space are being held open until Wednesday on this account.

Arrangements have been made in connection with the exhibition at the Municipal Pier for a series of conventions to be held there, among which are agricultural organizations, hardware trade and others.

### TRACTOR RALLY FRIDAY NIGHT

Milwaukee, Wis., Sept. 9—The Wisconsin Power Farming Association, organized recently at Milwaukee by manufacturers and distributors of farm tractors and power farm machinery, will hold a tractor rally here at the Republican house Sept. 13 to acquaint dealers and owners of such equipment with its plans to guarantee every owner proper service after he has been sold. The meeting is held at this time to take advantage of the presence of many dealers and owners attending the Wisconsin state fair, which closes on Saturday. During the fair, the association is making an energetic campaign for new members among the thirty-six tractor manufacturers represented on the grounds.

A special meeting of the association was held Tuesday evening, Sept. 3, at the Hotel Medford, Milwaukee, to discuss the tractor rally, membership campaign, and service plan. A special committee is still working on the details of the service plan, which will be ready for presentation at the rally.

An interesting discussion of the relative merits of implement dealers and motor car men as tractor dealers arose. The trend of arguments was that the motor car dealer in many respects has a decided advantage over the implement man in not only promoting the sale of tractors but giving service. The fear was expressed, however, that motor car dealers may desire tractor sales rights mainly as a temporary measure to "fill in" during the time when passenger car production is at low ebb. In justice to the motor car trade, however, it was stated that enterprising dealers would not sacrifice tractor rights as soon as the supply of cars again is ample, if they have made a success of tractor business and developed into the profitable line it is bound to be for them. While the feeling seemed to be that motor car men should be given every encouragement to engage in the tractor business, the warning was given that the implement dealer should by no means be neglected as a profitable outlet for tractors, and they should be shown every consideration, particularly in the direction of education, to meet the strong competition which it was admitted will be given them by the car and truck trade. This question is one of the most important before the members of the association and will be threshed out more fully at a subsequent meeting.

Boston last year drew an attendance of 225,000; last year both Kansas City and Minneapolis staged exhibitions that easily were the most important events of the kind held during the year in their respective territories. The Minneapolis show was the greatest automotive exhibition that has every been held and was larger, both in area and in the number of exhibits, than both the New York and Chicago shows together.

It is not unlikely that the annual Importers' Salon, which is held in the Hotel Astor, New York, also will be abandoned.

The action of the N. A. C. C., as reported in MOTOR AGE of last issue, was not wholly unexpected. Last year the trade wondered whether in view of the war the shows should be put on. This year sentiment against the shows has been augmented by the difficulty of obtaining a place in which to hold the New York exhibit. It has been rumored that the Grand Central Palace has been taken over by the Government and will be converted into a mammoth hospital. The rumor cannot be confirmed but there seems more than a grain of truth in it.



# Cars Cleaned and Greased Only Pay

## Specialist in Service Handles Twenty to Thirty-Two Cars Daily

THE Pioneer Auto Laundry Co., Kansas City, is taking in around \$250 a week, doing nothing but cleaning and greasing cars. In the few weeks since the business was opened it has been forced to secure additional space for handling cars—so quickly did the public respond to the offer of service it made.

The idea sprang up in the mind of a salesman for the Hyatt Buick Motor Co., who had so often heard owners wish somebody would wash their cars for them while they were downtown. The salesman's father, J. H. Durkee, took it up and organized a company, J. F. V. Voorhees coming in as secretary and treasurer. Mr. Voorhees was a motor car salesman; a young man with a wife who also wanted to work.

The company rented a vacant lot on motor row, McGee street, erected a wooden roof over a third of the lot, put up a gavanized iron building for an office and oil storehouse, put down wooden floors where the washing was to be done—and was ready for business.

Customers bring their cars in the morning, and call for them in afternoon or evening.

A ticket is provided, on which the customer checks the work he wishes done, "wash, polish, grease cups, grease universal, oil transmission, oil differential, oil springs, get out squeaks, clean cushions, clean inside top, clear outside motor, drain clean and fill motor, fill motor." The card bears the customer's name and an order number. A stub, detachable, bears the number and is given to the customer.

When the work on a car is completed, the charge for labor and supplies is noted opposite each item, and the total is the bill, which, of course, is paid in cash when the car is taken. The charges for washing run from \$1.50 up; polishing, 50 cents to \$5; greasing cups, \$1; greasing universal, \$1; cleaning top, \$1; draining and cleaning engine, \$1.50; getting out squeaks, 50 cents to \$1. When specific charges are not provided, labor is charged for at \$1 an hour; oil is charged for at 25 cents a quart.

Four negroes do the washing and most of the greasing. Mr. Voorhees attends to more technical details. Gasoline is not sold.

The moving of cars in the "laundry" is a time-consuming, and an important, part of the work. Naturally, the workmen are not dressed for sitting on clean cushions and operating the levers; when they do not push the cars about, Mrs. Voorhees gets in and takes them to stalls. She attends to the bookkeeping, to receiving cars and taking orders and to checking out.

Twenty to thirty-two cars are handled every day, the average charge on each being around \$4.

### 25,000 SEE FAIR TRACTORS

Philadelphia, Pa., Sept. 6—Demonstrations of various types of farm tractors with implement attachments and a motor truck show drew a large share of attention at the Philadelphia county fair at Byberry

this week. The attendance for the four days was estimated at 25,000. While the number of tractors making demonstrations was not large, the interest evinced in their operation, the crowds around each machine and the inquiries more than made up for the lack of models. Those shown were: Moline Universal 8-16, International 8-16, Deere Waterloo Boy 12-25, Parrett 10-20, Mogul 10-20 and two Cleverlands. There was also an Avery motor cultivator.

The demonstrator for one tractor said that he had recently sold eight to a Womelsdorf, Pa., dealer and was to deliver them in December. Demonstrators distributing descriptive matter from tents said that they expected to receive inquiries later from many potential prospects who asked nothing at the time, but took the pamphlets.

Two large tents, 200 ft. long, contained the show of commercial cars under the

auspices of the Motor Truck Association of Philadelphia, the first exhibit it ever made as a body. The demand for space was so great that the size of the allotments had to be curtailed. The committee in charge, consisting of J. C. Schwartz, A. W. LaRoche, S. M. Earley and the association's secretary, W. H. Metcalf, arranged for distribution of printed matter and the answering of questions as to the cars' performance and possibilities. Inquiries here, too, showed that the farmer of Pennsylvania is increasingly interested in commercial cars for food distribution. The large number of farmer cars parked attest the fact that already he is fairly well supplied in this regard in some districts of the state.

### HUDSON ON WAR BASIS

Detroit, Sept. 6—The Board of Directors of the Hudson Motor Car Co. has adopted the following war-time resolutions:

"Be it Resolved, That it is our plan to produce only those automobiles during the period of the war as are necessary to clear out the stock on hand and contracted for, which we estimate will be accomplished not later than Jan. 1, 1919, and that thereafter our plant resources and our entire manufacturing energy are to be devoted to war work."

The Hudson company had hoped that such a radical step would not be necessary and had thought that by converting part of the plant to war work, the percentage of which gradually has been increasing for the last year, they could meet the Government's requirements and still partially supply the demand for Super-Sixes. However, in view of the increasing war needs, the company feels it a patriotic duty to apply its entire plant resources to war work.

Not later than and probably before Jan. 1, all Super-Sixes made during the war will be out of dealers' hands. The Hudson factory and Hudson dealers now have on hand a sufficient supply of replacement parts to meet all needs over a prolonged period of time.

### WAR PROGRAM FOR WRENCHES

New York, Sept. 6—Manufacturers of drop-forged wrenches have adopted a war conservation program for the period of the war. They will discontinue immediately the manufacture of regular finished wrenches in addition to a long list of other wrenches which are considered unnecessary. Semi-finished wrenches may be eliminated later also and their place taken by what is styled a war-finish wrench which will be equally as good as the others though slightly different in appearance.

Wrenches no longer will be packed in separate envelopes, and all wooden boxes and sample and display boards for advertising them are eliminated. The lines retained as necessary are: engineers' wrenches, check nut wrenches, light cap screw wrenches, hexagon box wrenches, square box wrenches, flat handle "S" wrenches, set screw wrenches, tool post wrenches, single head socket wrenches, spanner wrenches, construction wrenches, structural wrenches, round handle track wrenches, car wrenches and light service wrenches, all of which have useful functions to such an extent as to make their

J. F. V. VOORHEES, Sec. and Treas. J. H. DURKEE, Mgr.

## WE SPECIALIZE

DEAR SIR,  
Your Auto No. \_\_\_\_\_ either needs good care by yourself or others. If you desire expert work done, we are your men. We do nothing but Wash, Polish, Grease, Oil, hunt for Squeaks, Clean Motor and Dress the Leather and Tops. Leave your car with us when you come down in the morning and it will be ready when you go home.

REMEMBER, these are war times and you should take GOOD CARE of Your Auto.

**Pioneer Auto Laundry Co.**  
1709-11 McGee St. KANSAS CITY, MO.

The kind of service the Pioneer Auto Laundry Co. offers

Pioneer Auto Laundry Co.	
STATION No. 1 No. 158	
1709-11 McGEE STREET	
Wash .....	
Polish .....	
Grease Cups .....	
Grease Universal .....	
Oil Transmission .....	
Oil Differential .....	
Oil Springs .....	
Get Out Squeaks .....	
Clean Cushions .....	
Clean Inside top .....	
Clean Outside of Motor .....	
Drain, Clean and Fill Motor .....	
Fill Motor .....	
Ready .....	
Name .....	
PIONEER AUTO LAUNDRY CO. No. 158	
Station No. 1	
1709-11 McGEE Street	
All cars MUST be called for by 6 P. M.	

This tag is for checking work to be done.  
The customer gets the stub



elimination doubtful from the viewpoint of conservation.

Those discontinued all are so-called heavy cap screw wrenches, including all millings from those blanks; 22½-deg. angle or textile wrenches including all millings from that line of blanks; concave "S" wrenches, machine wrenches, long flat angle wrenches, double head socket wrenches and all miscellaneous wrenches not mentioned in the preceding paragraph.

#### LANE TRUCKS FOR U. S.

Kalamazoo, Mich., Sept. 7—The Lane Motor Truck Co. is making fifty complete trucks a month for the Government, and the output will be increased to 100 a month within sixty days. The company expects within that time to be devoting itself 75 per cent to Government work. The trucks made are 1½-ton, 2-ton and 3½-ton.

#### TRUCKS FILL SHOW GAPS

Milwaukee, Wis., Sept. 9—Despite the restrictions imposed by the necessities of war, the fourth annual fall show of the Milwaukee Automobile Dealers' Association, which is being conducted this week in conjunction with the Wisconsin state fair, is the equal in size of any previous exposition. A small decrease in the number and variety of passenger cars is more than compensated for by enlargement of the motor truck section, and for the first time the tractor is being shown side by side with its older brothers.

The main idea of this year's show is to appeal to the farmer and the merchant of the interior of the state. This has been the object of past shows at the state fair, but under the newer conditions which have arisen, the utmost attention is being given to strictest utility. The fall show is a state exposition, while the annual show in January is somewhat more of a "citified" display as a matter of relative value to the respective patronages.

While the tractor show at the fair this year is again an out-door exhibition, partly under canvas, several Milwaukee distributors and dealers who recently have taken on tractor lines, are showing these in connection with their passenger and commercial car exhibits. Additional machines are for demonstrations, either on a section set aside in the fairgrounds or in neighboring fields, owners of which seem to be glad to have some of their fall plowing done at no expense to themselves.

#### ILLINOIS TRACTOR DEALERS

Springfield, Ill., Sept. 7—The Central Illinois Tractor Dealers' Association was organized here this week, officers being elected as follows: President, B. R. Butts; secretary, F. J. Sewigert; treasurer, Henry G. Garvey. The purpose of the organization is to place the tractor on a more competitive basis and to secure greater cooperation among the men who represent the various makes. Service and price problems were discussed at the initial meeting. There will be a series of meetings, and salesmen, distributors, dealers and factory representatives will get together and discuss subjects of mutual interest and adopt any measures which will be beneficial to all.

## A. A. A. Allows Official Race Records

### De Palma Set Seven and Chevrolet Four of New Speedway Marks

NEW YORK, Sept. 6—The Contest Board of the American Automobile Association has allowed the following official records:

Non-competitive 10-mile record by Ralph de Palma at Sheepshead Bay speedway, Aug. 24, in a Packard car. Time, 5:07.6. Official sanction No. 1103.

Competitive record 2 miles by Ralph de Palma at Sheepshead Bay, Aug. 17, in a Packard car. Time, 1:05.6. Official sanction No. 1099.

Competitive 10 miles by Ralph de Palma at Sheepshead Bay, Aug. 17, in a Packard car. Time, 5:23.8.

Competitive 20-mile record by Ralph de Palma at Chicago speedway, July 28, in a Packard car. Time, 10:50.2. Official sanction No. 1097.

Competitive 4-mile record by Louis Chevrolet at Chicago speedway, Sept. 3, 1917, in Frontenac car. Time, 2:14.22.

### No More Fords Until Peace

Detroit, Sept. 10—Special telegram—The Ford Motor Co. is discontinuing the manufacture of passenger cars for the period of the war. This is due to preparations for big production of the new one-man tank. It is stated that one which has been delivered to France has proved highly satisfactory, and big-scale production will be started.

Ford war work now consists of submarine chasers known as Eagles, Liberty engines, small tanks and other munitions.

It is expected that before long all the Ford assembly plants will be taken over by the Government. Some of them already have been taken over.

### New York-Chicago by Air

CHICAGO, Sept. 6—The first aerial mail between New York and Chicago was delivered here to-night at 7:04 o'clock by Pilot Max Miller of the aerial mail service. The trip took 23 hr. 55 min. Thousands of spectators at the Government war exposition on the lake front greeted his arrival. The mail was delivered to Capt. B. B. Lipsner, superintendent of the United States aerial mail service, and transferred by motor truck to the postoffice.

The second pilot, Edward V. Gardner, who left New York at the same time, will not reach Chicago until tomorrow morning. The total distance by air is 745 miles.

Regular service between New York and Chicago will be inaugurated Oct. 1. Letters mailed in New York will reach Chicago 10 hr. later. This first trip was in the nature of a pathfinding trip. Relays of flyers 150 miles apart will carry the mail in the regular air service. The postage rate will be the same as on the New York-Washington route, 16 cents for the first ounce and 6 cents for every ounce thereafter.

Competitive 6 miles by Ralph de Palma at Chicago speedway, Sept. 3, 1917, in a Packard car. Time, 3:21.1.

Competitive 15 miles by Ralph de Palma at Chicago speedway, Sept. 3, 1917, in a Packard car. Time, 8:18.9.

Competitive 25 miles by Ralph de Palma at Chicago speedway, Sept. 3, 1917, in a Packard car. Time, 14:12.72.

Competitive 75 miles by Louis Chevrolet at Chicago speedway, Sept. 3, 1918, in a Frontenac car. Time, 42:40.28.

Competitive 50-mile by Louis Chevrolet at Sheepshead Bay Sept. 22, 1917, in a Frontenac car. Time, 26:57.03.

Competitive 100 miles by Louis Chevrolet at Sheepshead Bay, Sept. 22, 1917, in a Frontenac car. Time, 54:20.98.

#### Dirt Track—Non-Competitive

Barney Oldfield in an Oldfield Special-Maxwellton 1-mile circular track St. Louis: 1 mile, 45 sec.; 2 miles, 1:30.4; 3 miles, 2:17.6; 4 miles, 3:05.6; 5 miles, 3:53.6; 10 miles, 7:56.2; 15 miles, 12:00.8; 20 miles, 15:52.2; 25 miles, 19:57.6; 50 miles, 40:47.6.

It was decided that fuel tests would be permitted only when they were laboratory tests held in a laboratory and by a technical man appointed by the chairman.

The following drivers were suspended: Barney Oldfield, permanent disqualification; Al. Cotey and Tom Alley, indefinite.

#### SCHOOLS TRAIN MECHANICS

Kansas City, Mo., Sept. 7—The third contingent of motor mechanics being trained for army service at the Sweeney and Rahe schools will complete the work during September and be assigned to various army posts. There are 4319 men divided equally between the Rahe and Sweeney schools and receiving motor car, truck and tractor training.

Nearly all the motor squad men have had more or less experience with motor cars. About 30 per cent are former garage mechanics; the others have owned cars or worked on them. In the schools they receive about the same instruction as is given to civilian students, and the range of work is as varied as when the schools were entirely on civilian basis. The men are placed in the departments where they can develop their highest capabilities, some being given training as truck drivers, others as mechanics, others as wiring experts.

The present contingent is providing a far larger number of tractor operators than any preceding squad. At both schools tractors are available, and instruction is given designed to prepare the men for operating the tanks on the battlefields. The huskier men are chosen for this department.

#### 1200 WAR TRACTORS A MONTH

Washington, Sept. 6—Production of military tractors is now averaging 1200 per month, according to a statement made here this week by the Acting Secretary of War. He stated further that this production is "not nearly what it should be."

# Tractors First at Indianapolis

## Even the Barber Had the Fever and Knew How to Talk Them

INDIANAPOLIS, Ind., Sept. 6—Tractors! Tractors! Everybody talks tractors. The other night when I came into Indianapolis and went to the hotel I found a disconsolate individual standing in front of the desk with a sort of lost look on his face as though he didn't exactly know where he was going from here. After getting my own name down the potentate behind the counter informed me blandly that all he had left was a big room sixteen stories up in the air which would hold two persons and unless I could find a roommate it was not for me. I took a look at Disconsolate and he gave me the once over and we both decided apparently that we could take one chance anyway, and soon we were on our way skyward in tow of a Senegambian bellhop of the female persuasion who was so black she was totally invisible between floors.

### Tractor for 1000 Acres

Once in the room, mutual introductions were in order and I discovered that my quondam roommate was no less a personage than B. F. Mason, Martinsville, Ind., proprietor of the Union Orchard & Nursery Co., originator of the Shippers Late Red peach, owner of immense peach orchards at Martinsville and in the Cumberland valley of Virginia and with the ambition to leave as a monument behind him an Indiana peach orchard of 1000 acres and worth a round \$1,000,000. Something was said about tractors and it came out that Orchardist Mason was looking for a satisfactory tractor to use on his big Indiana farm of more than 1000 acres, and that a duplicate would be put to work on his Old Dominion property. So we laid in bed and talked over the merits of various tractors until after midnight.

In the morning, with some films to be developed I hunted up a camera shop. Some necessary instructions about the develop-

By Fred M. Loomis

Motor Age Editorial Staff

ment and printing of the pictures brought out the fact that they had to do with tractors. The clerk who was waiting on me immediately lost interest in the films to lean across the counter and ask my advice as to the type, style and size of tractor he should buy to provide power on a small 40-acre farm he was trying to work nights and Sundays.

In the barber shop I was the interested listener to an animated conversation on the subject of tractors being carried on by the barber who was working on me and a friend of his, evidently in from the rural districts, who was being operated on in a neighboring chair. And the barber was pretty well posted on tractors at that. He talked about their construction and design in a way that showed he had a far more comprehensive and intelligent notion of what should constitute a desirable machine than have many dealers who make their living selling tractors.

On the streetcar going out to the grounds I overheard a discussion right behind me between a farmer and his wife. She wanted to go through the art, dairy and poultry exhibits, while he did not want to lose any time getting over to the tractor show. He won.

And surely there was some tractor show to see. I wouldn't exactly say the tractor display at the Indianapolis fair was a half what the show at the National Tractor Demonstration at Salina a month or so ago was, but it was numerically about half as big, there being exhibits of the tractors of twenty-five manufacturers. There were, of course, several times as many individual tractors, and beyond this there was not very much else to the display of equipment for the farm.

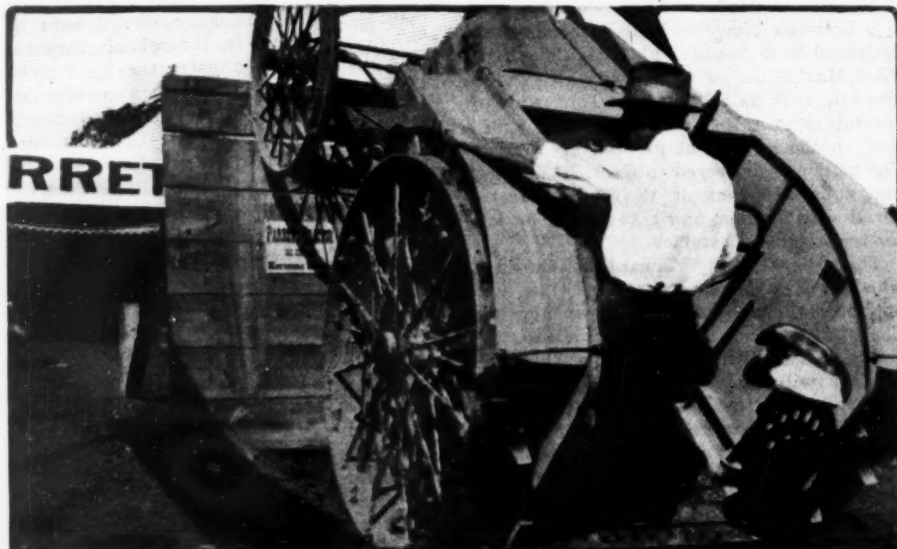
Tractors were shown at the fair by representatives of the following concerns: Star Tractor Co., Findlay, Ohio; Elgin Tractor Corp., Piqua, Ohio; Huber Mfg. Co., Marion, Ohio; The Russell & Co., Massillon, Ohio; Cleveland Tractor Co., Cleveland, Ohio; Besser Mfg. Co., Alpena, Mich.; Moline Plow Co., Moline, Ill.; Port Huron Engine & Thresher Co., Port Huron, Mich.; Wallis Tractor Co., Racine, Wis.; Midwest Engine Co., Indianapolis, Ind.; J. I. Case Threshing Machine Co., Racine, Wis.; Emerson-Brantingham Co., Rockford, Ill.; Interstate Tractor Co., Waterloo, Iowa; Waterloo Gas Engine Co., Waterloo, Iowa; International Harvester Co., Chicago; Henry Ford & Son, Dearborn, Mich.; Rock Island Plow Co., Rock Island, Ill.; Bull Tractor Co., Minneapolis, Minn.; Avery Co., Peoria, Ill.; Ohio Mfg. Co., Upper Sandusky, Ohio; Advance-Rumely Thresher Co., La Porte, Ind.; La Crosse Tractor Co., La Crosse, Wis.; Parrett Tractor Co., Chicago; Aultman-Taylor Machinery Co., Mansfield, Ohio; Turner Mfg. Co., Port Washington, Wis. Surely a goodly array.

### Some Unfamiliar Names

Among the foregoing are some names not overly familiar in the tractor world and on the grounds were a few machines which hardly ever before have been seen at an event as important as a state fair. Conspicuous among these are the Star, the Besser, the Whitney and Advance-Rumely 8-16.

The Star is a miniature Moline. Practically the same principles and characteristic features of construction have been followed, but on a reduced scale. The Star is only a one-bottom machine, although it has sufficient power to pull most of the equipment on the farm, such as a binder, mower, hay loader, manure spreader and the like. Also it has the same advantages as the Moline in the matter of planting and cultivating row crops and will handle double planter or a two-row cultivator. It has a clearance of 26 in., ample to permit of corn cultivation. It weighs only 1700 lb. and sells for \$900. For the present it will be marketed through the Indiana Silo Co., Anderson, Ind. Plans are under way to move the factory from Findlay to Anderson and greatly to increase the production.

The engine in the Star is a 3½ by 4½-in. four-cylinder, vertical, cast-in-block, L-head engine, with pump and splash lubrication, Kingston carbureter, centrifugal ball governor and Atwater Kent ignition. The clutch is of the contracting-band type. The transmission is sliding gear, with New Departure ball bearings. Final drive is by interchangeable sprocket and roller chain. It has a speed range of from 1 to 4 m.p.h., with four variations forward and reverse, speed being maintained at any point by an automatic governor. The drive wheels are 50 in. in diameter and have a 12-in. face. Steering is irreversible, fitted with ball bearings, telescoping column and control levers. The hitch is of universal type, adapted to fit any farm implement, while

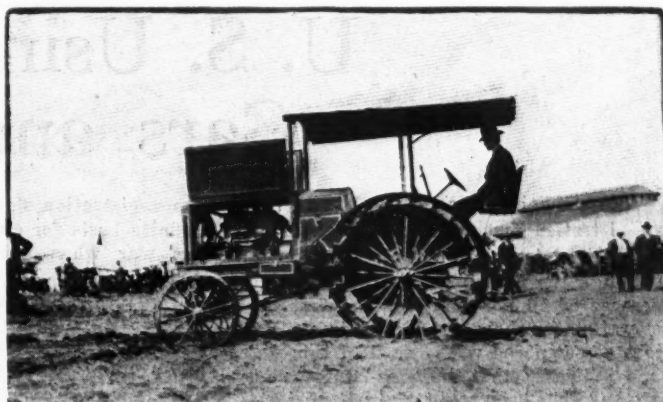


The Parrett shows its climbing ability





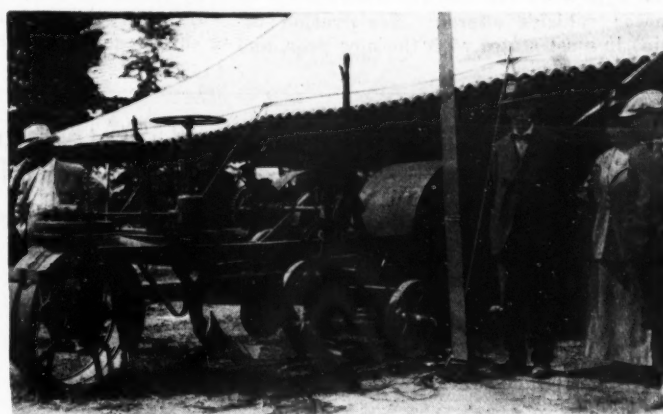
The Star-A new two-wheeler



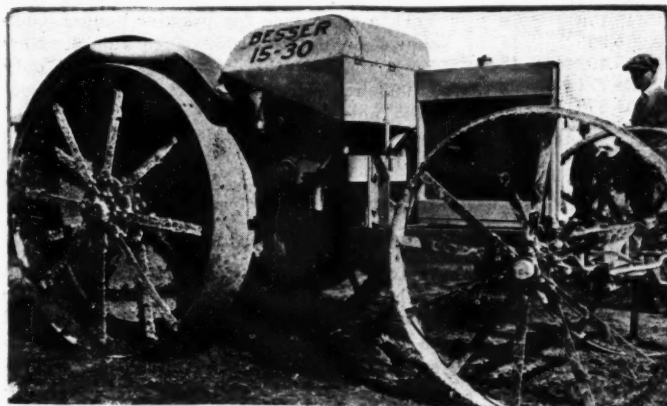
Solid comfort in a Port Huron



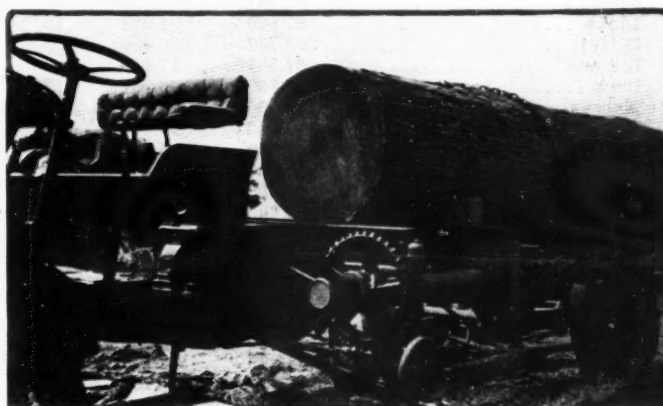
The Whitney—not often seen at shows



Advance-Rumely 8-16—something unusual



Note extra high wheels on the Besser



Amos log loader, a novelty at the fair

the operator sits on the implement drawn, making it strictly a one-man machine.

The Besser is a 15-30, three-plow, general purpose, four-wheel tractor. It is made in three styles, the main difference between them being in the engine. The style with engine four by 6 in. sells for \$1,595; the same style, but with Timken bearings, sells for \$1,695; the model with 4½ by 6-in. engine sells for \$1,895. Production for 1919 will be between 100 and 150 machines, which will be marketed impartially through distributors and dealers with respective commissions of 25 and 15 per cent.

The Besser tractor displayed at Indianapolis had a 4 by 6-in., four-cylinder, vertical, valve-in-head engine, set crosswise of the triangular frame of the machine. Future machines will have the same engine,

but it will be set lengthwise of the frame, the latter being modified to correspond to the new requirements. This also will necessitate a change in the gearset, and the new design will have a Nuttall transmission. Aside from these changes the 1919 Bissell will be essentially the same as the one displayed this year.

Magneto and carburetor on the Besser are Kingston, and the governor is flyball type. Bennett air cleaner is regular equipment. The Besser engine has 900 to 1000 r.p.m., with speeds of 2¼ and 4 m.p.h., with one speed reverse. Bearings are high-duty Hyatt. Steering is by irreversible worm and worm gear with motor car steering knuckles, giving a short turning radius.

The Besser tractor has a commodious operator's platform so that the operator is

not confined to his seat all the time. All control levers are within easy reach. The wheels are extra large, the rear being 54 by 12 in., while the front are 40 by 5 in. The wheelbase is 76 in.; length over all, 124 in.; width, 77 in.; height, 60 in.; weight, 4500 lb.

The Whitney is a four-wheel, chain-driven, two bottom tractor with a drawbar pull of 1600 lb. and a rating of 18 hp. on the belt. It has three speeds, 1¾, 2½ and 4 m.p.h. The engine is 5½ by 6½, two-cylinder opposed. Regular equipment is Bennett carburetor, Dixie high-tension magneto or Atwater Kent ignition. Lubrication is Madison-Kipp automatic. Transmission is of the sliding-gear type, with machine cut gears, inclosed in dust-

(Concluded on page 27)



# U. S. Using 5,466,931 Cars and Trucks

**W**AR conditions are reflected in the registration figures compiled by *Automotive Industries* and reproduced herewith. Although the figures as of July 1 show an increase of 10 per cent, for the first time several states show a reduction in registrations as compared with Jan. 1 of this year. This indicates that in such states many cars have not been registered but obviously are not in service, perhaps in storage.

It is the first real opportunity to study the figures on the use and distribution of motor vehicles offered. Registration begins in most states with the new year, and

the registration figures of July 1 offer a definite basis for studying the influence of the war when compared with those of Jan. 1.

The total registration July 1, 1918, was 5,466,931, deducting all duplications. This includes passenger cars, trucks, motor buses and trailers, where the last are registered. This is a gain of 525,665 motor vehicles, a gain made in the grain belt of the Mississippi Valley and the South, which started its motor boom more than a year ago. However, three of the six states that show a shrinkage in registration for the last six

months also are in the agricultural classification, while two are manufacturing states and one falls into a miscellaneous classification.

Massachusetts and New Jersey, both containing large centers of population and both manufacturing rather than agricultural states, are among the six states showing an actual loss. Maine also shows a decrease. The remaining three are agricultural states—Minnesota, Texas and Oklahoma. No doubt the dry weather in the last year had something to do with the decrease in Texas and Oklahoma, though no reason can be advanced for the reduction in Minnesota. All six showed large gains the first six months of 1917. The comparison of the change in registration for the corresponding periods of 1917 and 1918 follow:

	Gain first half 1917	Loss first half 1918
Oklahoma .....	19,728	9,499
Massachusetts .....	6,061	7,890
Texas .....	2,313	5,161
New Jersey .....	44,253	4,596
Minnesota .....	30,500	3,281
Maine .....	3,618	1,961
	106,473	32,388

In New Jersey and Massachusetts the drop undoubtedly is due largely to decreased sales in New York and Boston.

Contrast the drop in registration of these six states with the almost phenomenal gain made by Ohio, which is running New York a close race for premier honors. Ohio shows a gain of 83,159 since Jan. 1. New York, on the other hand, has gained only 11,903 registrations in the same period. Ohio now has 415,962 registrations, as of July 1, 1918, while New York had 422,853 on the same date. If Ohio continues to gain at the same rate it will be leading New York Jan. 1, 1919.

## California Next

Next to Ohio in gains comes California with an increase of 69,052. Iowa, leader when it comes to cars per capita, is third in registration gains with 46,787. Pennsylvania, which in 1917 gained many registrations, only shows 19,724 more registrations as of July 1 as compared with a gain of more than 35,000 a year ago.

The utilitarian aspect of the passenger car is shown by the evidence given by the fifteen states that lead in registration gains, which are agricultural states. Ohio, California and Kansas head the list and are all agricultural states. A group of farming states follow—Illinois, Missouri, Michigan, Nebraska, North Dakota, Oregon, South Dakota, Washington and Arkansas, as well as Kentucky and Tennessee. Actual registration gains in these states are:

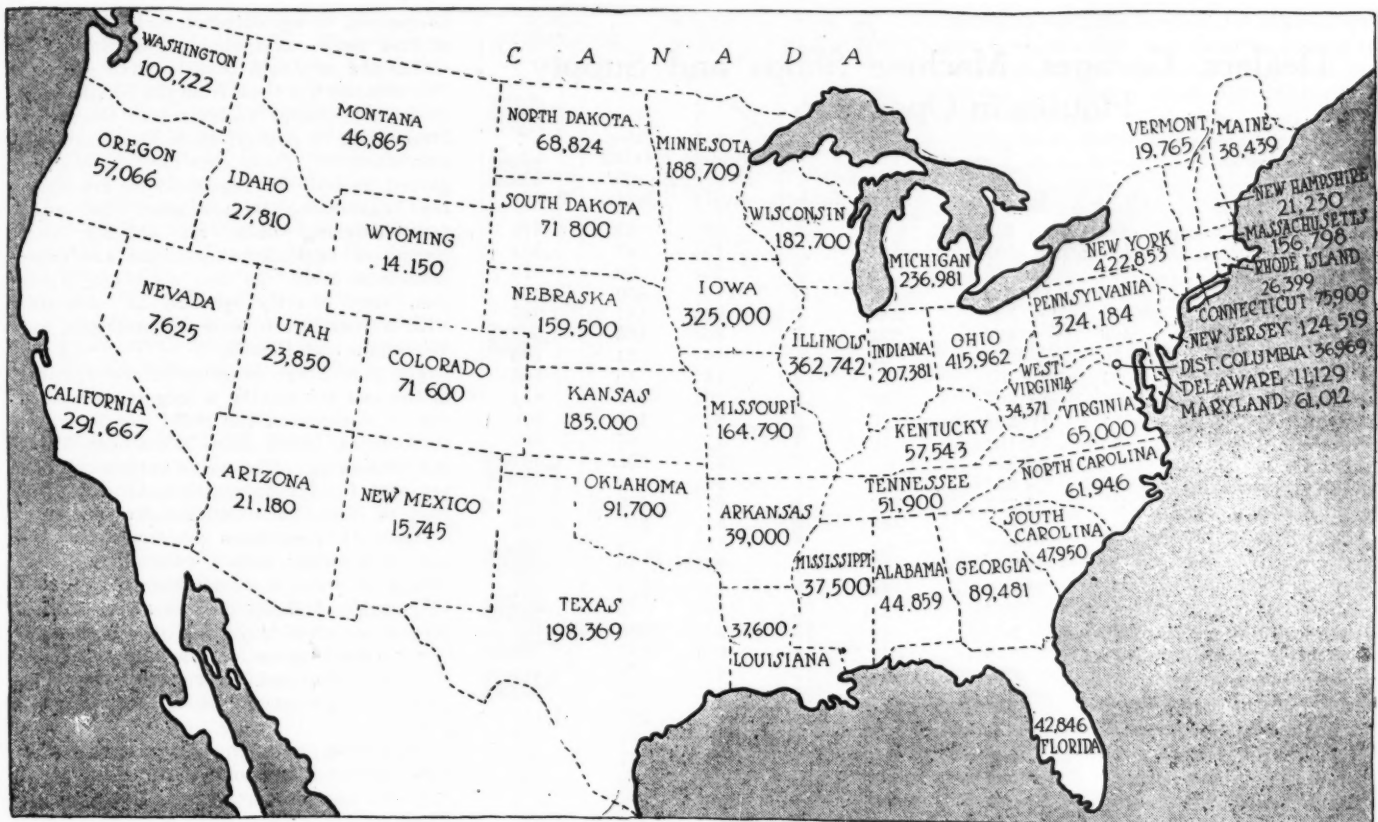
Illinois .....	22,450
Pennsylvania .....	19,724
Missouri .....	18,974
Wisconsin .....	17,154
Michigan .....	17,019
Nebraska .....	11,499
North Dakota .....	6,121
Oregon .....	8,434
South Dakota .....	10,842
Washington .....	6,900
Arkansas .....	10,138
Kentucky .....	10,138
Tennessee .....	5,500

## Cars and Trucks in United States July 1, 1918, Increase in Registration and Present Population

All Duplicate Registrations Have Been Deducted

	Cars and Trucks	Increase	Per Cent Increase	Pop. July 1, 1917 Census	Pop. per Car
Alabama .....	44,859	11,896	36	2,363,939	52
Arizona .....	21,180	1,914	9	263,738	12
Arkansas .....	39,000	10,138	35	1,766,343	46
California .....	291,667	69,052	24	3,029,032	10
Colorado .....	71,600	6,350	9	988,320	13
Connecticut .....	75,900	1,258	1	1,265,373	16
Delaware .....	11,129	958	8	215,160	19
District of Columbia .....	36,969	15,771	74	369,282	9
Florida .....	42,846	4,530	10	916,185	21
Georgia .....	89,481	17,025	23	2,895,841	32
Idaho .....	27,810	4,084	13	445,176	16
Illinois .....	362,742	22,450	6	6,234,995	17
Indiana .....	207,381	17,154	8	2,835,492	13
Iowa .....	325,000	46,787	17	2,224,771	6
Kansas .....	185,000	25,658	16	1,851,870	10
Kentucky .....	57,543	10,143	21	2,394,093	41
Louisiana .....	37,600	6,350	6	1,856,954	49
Maine .....	38,439	* .....	..	777,340	19
Maryland .....	61,102	2,884	4	1,373,673	22
Massachusetts .....	156,798	* .....	..	3,775,973	24
Michigan .....	236,981	16,019	7	3,094,266	13
Minnesota .....	188,709	* .....	..	2,312,445	12
Mississippi .....	37,500	5,850	18	1,976,570	52
Missouri .....	164,790	18,974	18	3,429,595	21
Montana .....	46,865	4,601	10	472,935	10
Nebraska .....	159,500	11,499	7	1,284,126	8
Nevada .....	7,625	740	10	110,738	15
New Hampshire .....	21,230	166	7	444,429	20
New Jersey .....	124,519	* .....	..	3,014,194	24
New Mexico .....	15,745	1,659	12	423,649	26
New York .....	422,853	11,903	2	10,460,182	24
North Carolina .....	61,946	6,121	11	2,434,381	39
North Dakota .....	68,824	5,831	9	765,319	11
Ohio .....	415,962	83,159	24	5,212,085	12
Oklahoma .....	91,700	* .....	..	2,289,855	24
Oregon .....	57,066	8,434	17	861,992	15
Pennsylvania .....	324,184	19,724	6	8,660,042	26
Rhode Island .....	26,399	1,257	5	625,865	23
South Carolina .....	47,950	10,028	26	1,643,205	34
South Dakota .....	71,800	10,842	16	716,972	9
Tennessee .....	51,900	5,500	11	2,304,629	44
Texas .....	198,369	* .....	..	4,515,423	22
Utah .....	23,850	3,024	14	443,866	18
Vermont .....	19,765	64	3	364,946	18
Virginia .....	65,000	9,339	17	2,213,025	34
Washington .....	100,722	6,900	7	1,597,400	15
West Virginia .....	34,371	5,094	13	1,412,602	41
Wisconsin .....	182,700	18,169	11	2,527,167	13
Wyoming .....	14,150	1,649	13	184,970	13
	5,466,931	530,568	12	103,640,473	22

\* Registrations for first six months show decrease.



This map shows the distribution of the cars and trucks of the United States, duplicate registrations deducted

### Car, Truck and Motorcycle Registrations in the United States to July 1, 1918

State or Territory	Gross registration	New registration	Registration up to Jan. 1 1918	Gasoline passenger cars in use	Gasoline commercial cars in use	Electric passenger cars in use	Electric commercial cars in use	Non-resident registration*	Re-registered**	Chauffeurs registered	Total fees	Motor cycles registered†
Alabama	44,859	11,986	32,873	36,844	8,015	6			624	318	131,513	
Arizona	21,804	1,914	19,890								390,000	
Arkansas	39,000	10,138	28,862	37,500	1,500						3,115,924	21,309
California	314,918	69,052	245,866						23,251	9,900	308,530	4,500
Colorado	73,200	6,350	66,850					1,600		12,400	1,129,712	4,000
Connecticut	75,900	1,258	74,642	62,300	13,600					85,000	156,802	683
Delaware	11,658	958	10,700						529	13,677	137,083	1,920
Dist. of Col.	36,969	15,711	21,198	31,634	4,736	599				9,851	328,539	1,494
Florida	43,746	4,530	39,216	39,243	4,503				900	3,609	310,473	3,005
Georgia	89,876	17,025	72,851	85,326	4,550				395	4,300	525,509	600
Idaho	28,800	4,084	24,716			3			190	750	2,571,505	7,563
Illinois	362,742	22,450	340,292							38,186	1,170,732	7,000
Indiana	209,346	17,154	192,192						1,965	3,804		
Iowa	325,000	46,787	278,213									
Kansas	185,000	25,658	159,342									
Kentucky	57,543	10,143	47,400									1,212
Louisiana	38,000	6,350	31,650						400			400
Maine	39,538		41,499	35,929	3,609					46,873	502,297	1,178
Maryland	63,827	2,884	60,943	57,985	5,411	221	210		2,815	8,173	751,142	4,180
Massachusetts	166,384		174,274	136,684	29,700				9,586	26,368	1,843,595	10,074
Michigan	242,712	16,019	226,693	219,292	23,420			285	5,446	19,420	2,569,137	6,505
Minnesota	188,709		192,000							4,000	943,545	4,128
Mississippi	37,500	5,850	31,650									
Missouri	170,001	18,974	151,027						5,211	18,110	1,335,914	3,320
Montana	47,350	4,601	42,749									
Nebraska	159,500	11,499	148,001						485	1,204	320,088	722
Nevada	7,625	740	6,885									
New Hampshire	22,433	166	22,267					703	500	8,200	33,227	105
New Jersey	137,322		141,918	124,006	13,116	200			12,803	168,267	290,070	1,940
New Mexico	15,745	1,659	14,086								1,420,037	10,307
New York	422,853	11,903	410,950	335,245	67,330					122,873	3,571,410	24,838
North Carolina	62,071	6,121	55,950					125			326,979	1,432
North Dakota	68,824	5,831	62,993								424,985	1,537
Ohio	425,789	83,159	342,630			4,265			9,827			20,182
Oklahoma	91,700		100,199									1,182
Oregon	57,066	8,434	48,632				50					
Pennsylvania	344,877	19,724	325,153	319,498	25,379				20,693		3,538,057	21,907
Rhode Island	26,399	1,257	25,142	21,413	4,986					20,200	139,564	1,435
South Carolina	48,350	10,028	38,322							400	275,153	971
South Dakota	78,000	10,842	67,158						6,200			1,008
Tennessee	54,000	5,500	48,500						2,100			800
Texas	214,560		219,721					103	16,088	14,867	1,754,576	2,422
Utah	24,600	3,024	21,576						750	1,300		1,125
Vermont	20,431	64	20,367	18,795	1,627	8	1		666	3,390	362,964	606
Virginia	65,000	9,339	55,661							3,680		2,000
Washington	100,722	6,900	93,822	87,756	12,966						758,620	5,099
West Virginia	36,400	5,094	31,306					608	1,421	3,363	603,072	996
Wisconsin	182,700	18,169	164,531	177,000	5,700						1,862,565	6,000
Wyoming	14,150	1,649	12,501								69,170	240
Total	5,595,499	529,135	5,085,859	1,878,774	234,840	5,302	261	3,424	124,344	652,083	\$33,992,489	191,914

NOTE.—Steam cars and trucks are included with the gasoline vehicle statistics, as segregation is not carried out by registration officials. \*Number of registered owned by citizens of other states. \*\*Number of vehicles re-registered, owing to transfer of ownership, etc. .... Statistics not available. †This is an independent column, having no relation to the figures given in any other.



## Dealers, Garages, Machine Shops and Supply Houses in Operation

State	Dealers	Garages	Repair-shops	Jobbers	Supplies Exclusively	Cos. Having Supply Depts.	Totals
Alabama	191	119	83	3	26	51	473
Arizona	131	107	64	..	12	47	361
Arkansas	208	120	74	1	20	50	473
California	1,309	1,413	697	17	170	450	4,326
Colorado	351	329	180	2	24	141	1,027
Connecticut	486	478	291	7	85	156	1,503
Delaware	70	71	27	..	6	21	195
Dist. of Col.	51	53	32	2	18	10	166
Florida	293	267	159	2	36	117	874
Georgia	321	297	170	2	61	105	956
Idaho	174	124	70	1	15	66	450
Illinois	2,066	1,970	1,093	17	133	622	5,901
Indiana	1,013	822	369	10	66	308	2,588
Iowa	1,645	1,383	768	8	67	699	4,572
Kansas	957	873	440	8	33	357	2,668
Kentucky	306	245	99	3	25	78	756
Louisiana	165	90	52	4	20	36	367
Maine	261	292	124	3	18	128	926
Maryland	235	244	111	2	29	73	694
Massachusetts	838	943	419	17	142	239	2,598
Michigan	957	835	349	8	96	297	2,542
Minnesota	1,113	843	449	15	41	279	2,740
Mississippi	157	98	37	..	15	44	351
Missouri	835	670	382	16	62	216	2,141
Montana	263	224	127	2	15	93	724
Nebraska	356	680	270	11	21	231	1,569
Nevada	53	56	25	..	4	18	156
New Hampshire	194	217	103	..	10	98	622
New Jersey	699	946	446	1	88	256	2,436
New Mexico	95	95	36	..	7	47	280
New York	2,023	2,435	1,175	14	334	678	6,659
North Carolina	317	257	112	1	25	104	816
North Dakota	477	324	177	1	10	141	1,093
Ohio	1,736	1,322	648	26	143	509	4,384
Oklahoma	464	344	143	2	29	149	1,131
Oregon	237	233	112	2	27	75	686
Pennsylvania	1,803	1,817	824	18	216	681	3,839
Rhode Island	95	137	87	5	..	18	342
South Carolina	225	130	68	2	19	57	501
South Dakota	449	340	151	2	11	109	1,062
Tennessee	237	153	114	3	28	76	611
Texas	820	653	284	12	90	217	2,076
Utah	107	71	49	3	13	26	269
Vermont	180	161	96	..	9	75	521
Virginia	303	203	120	2	47	76	751
Washington	417	332	182	6	51	100	1,088
West Virginia	261	158	69	..	17	72	577
Wisconsin	1,026	900	406	10	47	327	2,719
Wyoming	80	67	38	..	9	23	217
Ter. of Hawaii	11	8	10	..	5	9	43
West Indies	28	24	3	..	4	9	68
Canada	970	853	357	21	75	211	2,487
Mexico	8	10	3	..	2	2	25
Total	28,619	25,836	13,040	292	2,589	9,106	79,482

These gains are really more conspicuous than the reduced gains in what might be called manufacturing states and those with large centers of population. Aside from New Jersey and Massachusetts, with their decreases, Maryland and Delaware, both essential manufacturing states, show small gains compared with the corresponding period a year ago. Delaware has added 958 and Maryland 2824. Connecticut, a leading manufacturing state and one that gained heavily a year ago, added only 1258 in the last six months. Rhode Island added only 1257.

The manufacturing states that have as compared with 12,225 in 1917. Other gains in the same period are: North Carolina 6121 as compared with 4656; West Virginia 5094 compared with 4646; Kentucky

10,143 compared with 7200; and in South Carolina and Mississippi the figures for this year are practically the same as those for last year. The influence of cotton and lumber in the South is strongly shown in these figures.

No other one section of the country has shown such a drop this year as New England, which has a total of 7106 fewer registrations as of July 1 than a year ago. Two of these six states show losses and the gains of the other four are scarcely a quarter of the total drop in Massachusetts and Maine. Vermont has increased by but sixty-four; New Hampshire by 166; Rhode Island by 1257, and Connecticut by 1258. Two show a total loss of 9851 and the other four a total gain of but 2745. New England is essentially manufacturing

as opposed to agricultural, and here is one of the most convincing arguments as to where the cars sold in 1918 have gone to. The demand has been from the fertile acres of the Mississippi Valley rather than from the centers of population or the centers of manufacture. These cars have been going gained heavily in registrations are those that cannot be termed more the quasi-manufacturing ones, all sharing very largely in agricultural pursuits and often mining as well. In this class are Michigan, very heavily reduced as compared with a year ago in new registrations, and Wisconsin and Illinois.

The percentage of gains in registrations in the last six months is largest with what can be designated the Solid South, which showed very heavy gains in January. These are continuing. The gains approximate 30 per cent for the area. Naturally the District of Columbia, with its unprecedented increase in population since the war began, is a leader with a gain of 15,771 as compared with a corresponding gain of 1470 in the first six months of 1917. Its percentage gain is 74. With the population of Washington increased approximately 100,000 it is not surprising that such a gain in registrations should have taken place.

Continuing with the Solid South, Alabama shows a gain of 11,986 as compared with 6749 a year ago in the same period. Florida has gained 4530 compared with 1770 last year. Georgia has gained 17,025 into 100 per cent utilitarian service and not into any so-called avenues of luxury.

### Mining States Show Drop

What might be designated the mining states of the West all show a dropping off in registrations. There are six of these states and as a group they do not show so heavy a falling off as the manufacturing area of New England. The entire six have only added about 18,000 new registrations, not so many as Missouri. The figures showing registration gains in the first half of this year are:

Arizona	1,914
Colorado	6,350
Idaho	4,080
Nevada	740
Utah	3,024
New Mexico	1,659

It is impossible to give complete and accurate registrations on motor trucks as many states do not segregate them. Taking definite figures from those states that have them and obtaining estimates from others, a conservative estimate put the total number of trucks in use at 500,000. Until recently all the trucks were used in the environs of the larger centers of population and in the smaller cities, but the farmer has become a factor in truck buying and the truck is going onto the farm along with the tractor, the electric lighting outfit and the individual type of ice making machine. Further analysis of the registration figures for the several states emphasize two indisputable facts:

One—The shortage of farm labor is compelling the continuance of the purchase of motor cars to such an extent that the farmer consuming time with the slow horse is being looked upon as a soldier of industry who is working below his possible and desirable capacity in these war days.

Two—The law of supply and demand is working out admirably in manufacturing



and population centers where car sales have uniformly fallen off. This is convincing proof of the extent to which this part of our population has been supporting all forms of war subscriptions and indicates the natural falling off that must be expected due to the removal of the young men who have gone to France. It is an answer to the luxury argument. It is a reminder to those who visualize the national aspect of the car from the streets and highways of our Atlantic seaboard, that the true picture of the passenger car in its varied aspects of utility is found in the grain areas between the Alleghanies and the Rockies and on the Pacific slope beyond.

### \$20,000,000 FOR TRACTORS

Philadelphia, Pa., Sept. 6—A \$20,000,000 corporation is being organized here to finance the manufacture of tractors from maker to consumer, according to Franklin Spiess, an investigator of the proposition. Five Philadelphia bankers, whose names are withheld until the plans are more advanced, are to put \$2,000,000 apiece into the corporation at its inception, it is said, and it is possible that these may influence other capital or there may be a certain amount of stock-selling.

Behind the tractor proposition is the intention of financing to a limited extent the tenant farmer, whose tractor paper no bank will honor at present. By giving him a chance to buy his tractor on time, ground that otherwise might lie idle can be placed under immediate cultivation, it is believed.

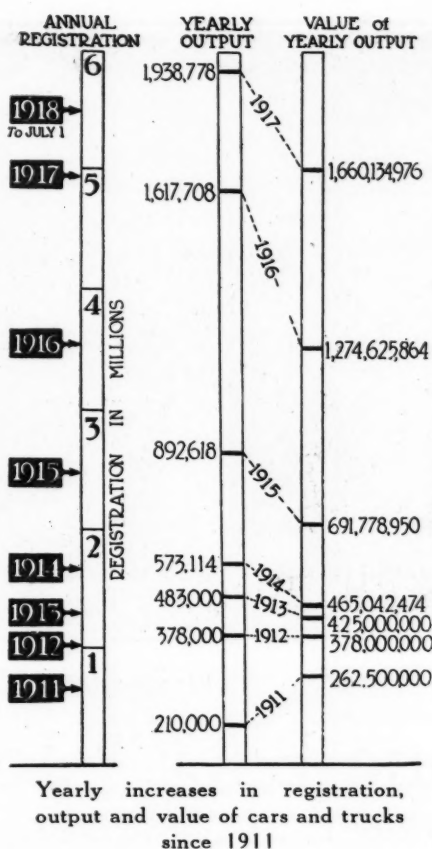
### MADISON MERGES WITH BULL

Indianapolis, Ind., Sept. 6—The Madison Motors Corp., which was formed in 1915, has merged with the Bull Tractor Co., Minneapolis, Minn. The capital is \$1,500,000 preferred and \$1,200,000 common stock. Cecil Gibson, formerly president and general manager of Madison, is president of the new company, L. A. Brown is treasurer and John F. Green and Frederick N. Judson, formerly controllers of the Bull company, are the board of directors. The factory of the new company is located at Anderson, Ind.

### OHIO FORMS TRANSPORT BODY

Columbus, Ohio, Sept. 6—Organization of the highways transportation situation in Ohio is to be put on a solid basis under the direction of the National Council of Defense. A complete state-wide organization is to be effected for carrying out the work, which is being undertaken by the highways transportation committee of the Council of National Defense.

Plans for organizing Ohio were brought to this state from Washington by Raymond Beck, for some years head of the National Touring Bureau of the B. F. Goodrich Co. The personnel of the new organization in Ohio has not been determined. There is to be a state highway transport committee of five members. There will also be a state chairman appointed with the approval of the Governor. The state will be divided into five districts, each of which will be under the jurisdiction of one of the five committeemen. The central committeemen will have under them local organizations to be known as district highway transport com-



### DISTRIBUTION OF CAR, TRUCK, TRACTOR AND ENGINE MANUFACTURERS IN THE UNITED STATES AND CANADA

State	Cars	Trucks	Tractors	Engines	Total
California	4	9	8	21	42
Colorado	1	1	1	1	4
Connecticut	2	2	3	7	14
Delaware	1	1	1	1	4
District of Columbia	1	1	1	1	4
Georgia	1	1	1	1	4
Illinois	17	35	18	4	74
Indiana	26	14	7	5	52
Iowa	1	6	7	1	15
Kansas	1	1	1	1	4
Kentucky	2	2	1	5	10
Louisiana	1	1	1	1	4
Maine	1	1	1	1	4
Maryland	1	1	1	1	4
Massachusetts	5	14	3	1	23
Michigan	40	44	13	17	114
Minnesota	7	11	23	2	43
Missouri	4	6	7	1	18
Nebraska	1	2	1	1	5
New Hampshire	1	1	1	1	4
New Jersey	3	6	1	1	11
New York	16	37	6	7	66
North Carolina	1	1	1	1	4
North Dakota	1	1	1	1	4
Ohio	27	38	13	6	84
Oklahoma	3	2	1	1	7
Pennsylvania	8	28	5	6	47
Rhode Island	1	1	1	1	4
South Carolina	1	1	1	1	4
South Dakota	1	1	1	1	4
Texas	2	2	1	1	6
Virginia	2	1	1	1	5
Washington	1	4	3	1	9
West Virginia	1	1	1	1	4
Wisconsin	6	12	17	8	43
Canada	17	10	4	1	32
Total	198	295	145	72	710

mittees, with a chairman for each county. Headquarters will be at Columbus, and the committee in general will work under instructions from Washington.

In each large center of the state, it is intended to establish return load bureaus, the purpose of which is to keep the shippers and motor truck operators in close communication. This bureau will work in co-

operation with the rural motor express system in such a way that farmers coming to the large centers may get in touch with the bureau and secure goods for delivery to their neighbors.

The rural motor express system in its further scope is required to conserve the trucking facilities. It is expected to establish a substantial, prompt, and efficient system of haulage between the agricultural districts and the consuming centers. It also aims to save duplication of effort and to put the trucks which are already in use to a maximum of service.

A system of hauling intra-city freight may also be worked out as a substitute for shuttle service on the railroads, as it is expected to release a considerable amount of railroad equipment for longer hauls. Inland waterways are to be developed as feeders to the Great Lakes system in an effort to further relieve the railroads.

There will be a general education campaign to acquaint shippers in Ohio with the facilities presented, so that they may avail themselves of these facilities.

In all this work the state highway transport committee will be expected to work with the state administration, the highway department, the motor vehicle department, the public utilities department, the Ohio State Automobile Association and the State Grange.

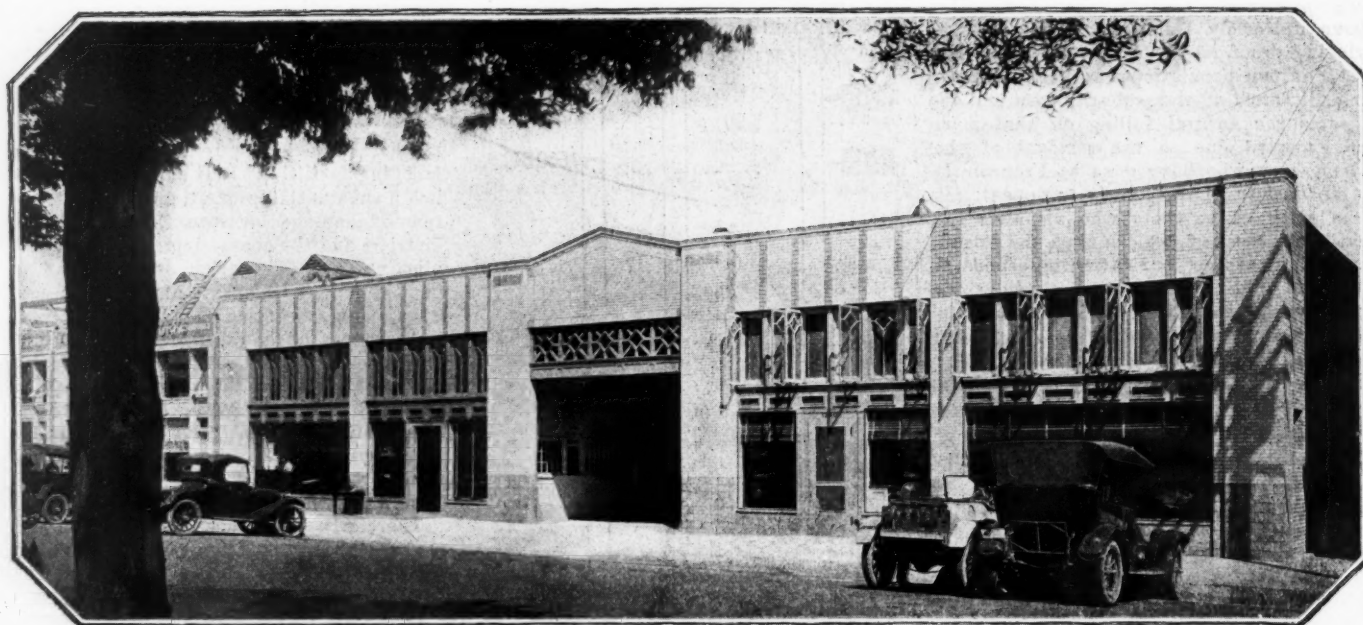
### SAVING TIME FOR TRUCKS

Detroit, Sept. 6—The campaign of the Detroit Board of Commerce to conserve man and truck power shows a 25 per cent saving of time consumed in delivering a 3½-ton peddler load. Repeat orders during the same day have been practically eliminated, sidewalk delivery is being accepted throughout the city, and that the retailer no longer delays the truckman by refusing to immediately receipt for goods, it is reported.

This campaign was started about three months ago, when 75,000 "Four ways you can help" cards were furnished by the wholesale merchants' bureau to its members throughout the city. The wholesalers sent these cards out with their statement to the retailers or gave them to the truck drivers to be distributed by them. In this way practically every retailer in the city and many customers were made acquainted with the campaign. The necessity of conserving man power and truck time was shown to be a wartime necessity. Two weeks later 100,000 cards bearing the message, "Don't keep the driver waiting" were distributed in the same manner. This was followed by wholesalers placing on their delivery trucks a large placard reading, "Don't delay this truck."

### PURITAN GETS ALCO PARTS

Detroit, Sept. 6—The Puritan Machine Co. has purchased from the American Locomotive Co. the entire service repair parts business, including the existing stock of spare parts, tools, jigs, dies, blueprints, etc., covering the Alco passenger cars and trucks formerly manufactured in Providence, R. I. The service business will be continued from the Providence plant for the present. The Puritan Machine Co. is handling repair parts for over 100 different makes of cars.



The present home of the Electric Equipment Co., Los Angeles, Cal. Note the absence of all signs

## No "Come-Back" Jobs Here

### Electric Equipment Co. Emphasizes Service in Which Things Are Done Right

**E**IGHT years ago, on South Olive street, Los Angeles, Cal., a huge sign, "Electric Equipment Co.," almost obscured the front of that part of a building in which the concern engaged in magneto and coil repair work. To-day the same company occupies the largest and most complete building devoted exclusively to automotive electrical repair work on the Pacific coast. There is not a sign of any kind on the building, the name appearing only inconspicuously in gold letters on two windows. The structure was completed but recently and represented the second removal to larger quarters in two years. The huge sign on the first location and the absence of such display on the new home may be said to represent the difference between success hoped for and success attained.

#### Five Years Ago

Ray Thomas, the guiding spirit of the Electric Equipment Co., started a battery service department on his own initiative about five years ago. At that time there was not a battery factory service station in Los Angeles. The Thomas company did good work, and it was not long until several factory-supported service stations were established. Some of the factories later decided it was better business to appoint the Electric Equipment Co. as their representative, and the magneto and electric starter makers have tried to force their propositions on the Thomas company.

The new home is a one-story building of unusually good design, 100 by 155 ft. The driveway from the street to the service department is wide enough for three cars to pass. In the battery department are accommodations for 2000 batteries on tables and racks at the same time. Some three-

tier tables are in use. In the stockroom are more than half a million parts carefully binned, and, more important, each is cataloged so there is not an instant's delay in laying hands on a part when needed.

When Mr. Thomas acquired control of the company there were three employees besides himself. To-day there are fifty-five employees of the concern actively engaged in Los Angeles, and success has been so marked that a branch has been established at San Francisco where forty workers are engaged and at the Fresno store there are five. In addition to these branches the company has a chain of service stations in practically every city in California.

Mr. Thomas knows how to handle employees, and that is one of the secrets for his company's growth and development. He encourages experimentation, and as the result one of his men has invented a magnet meter that measures the strength of a permanent magnet immediately. It is said to be the only known device of this kind and is marketed throughout the world. Another invention by a shop employee is a magnet charger, used for charging permanent magnets.

Within recent weeks young women have been given employment about the place outside of the offices. Girls are used as battery testers and in the order and checking departments. The testers have to come in contact with the public constantly, and while preferring girls of good appearance Thomas declares good looks are not essential to doing their work well.

It can be said truthfully of this company that it gives service. In fact, the free service costs between \$700 and \$800 each month. The free work consists of testing

batteries, inspecting and testing generators and starters and making any minor adjustment that does not require more than 15 min. time. It is mainly to its service department that the present success is attributed. The company acts as distributor and service station for Eisemann and Mea magnetos, Bijur starters, Ward Leonard regulators, North East starters, Westinghouse starters, Klaxon horns, USL batteries, Atwater Kent ignition, Dyneto starters, Eeco magnet chargers and magnet meters and Leece-Neville starters. It distributes USL batteries in seven states and distributes several of the other devices throughout California.

#### No Come-backs

The one thing insisted upon by Mr. Thomas is that the Electric Equipment Co. have no come-back jobs. Things must be done right, according to the company's judgment. An inspection is made to ascertain what the trouble is. The owner is told what is at fault and how much it will cost to make the necessary repairs. There is no compromise or half way of doing things. If the owner does not select to have the work done at the price stipulated, he is at liberty to take it elsewhere. Once done, the company stands behind its work and has such a pleasant way of doing this that the public likes it. There is no such thing as a dissatisfied customer. He knows what he will have to pay in advance and that a good job has been done when he gets his car back.

The company operates on a spot-cash basis. This is one happy result of telling at the time the work is accepted what it will cost. It also does away with the troubles of collection and losses on poor accounts





The "testerette" of the Electric Equipment Co., one of the young women who are employed

and is a means to economy in the end. A fair price always is established to start with, and there is no haggling or bickering afterward. Mr. Thomas has shown through his conduct of the affairs of the Electric Equipment Co. the vast possibilities there are in this line of work to any concern that makes it a point to be fair alike to customers and itself. "There must be no come-back jobs" is a good motto for any company.

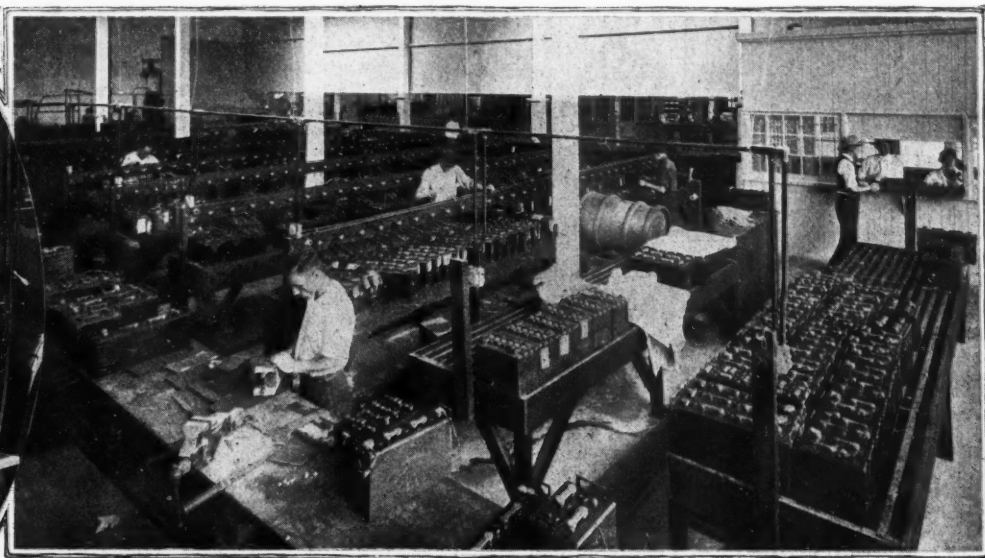
#### TRACTORS AT INDIANAPOLIS

(Concluded from page 21)

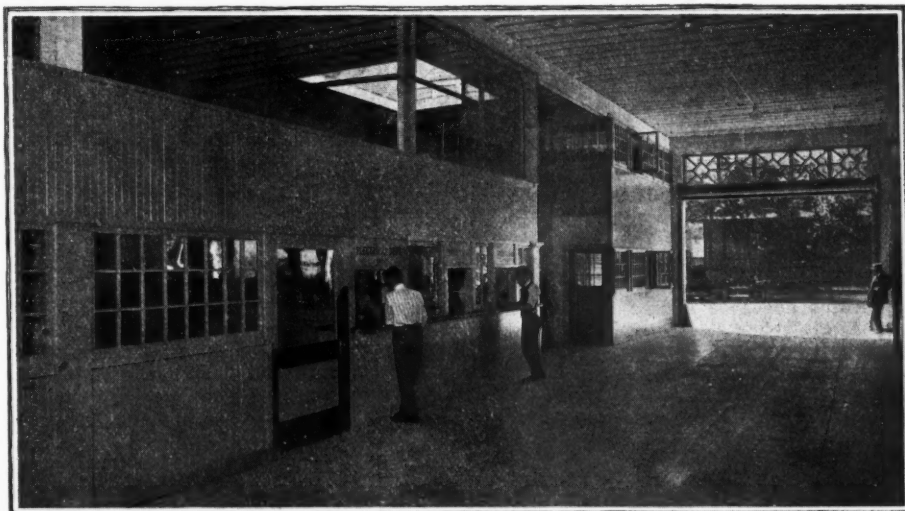
proof case and running in oil. The Whitney has 48 by 10-in. drive wheels and 30 by 5-in. front wheels. The wheelbase is 82 in.; length, 123 in.; width, 56 in.; height, 58½ in.; weight, 3000 lb.

The Advance-Rumely 8-16 has been exhibited before but is not so familiarly known as some of the other models made by the company. It differs from the Oilpull design in almost every particular. It is essentially a plowing machine, the plows attaching beneath the frame and directly behind the big drive wheel. The drawbar is on the front of the tractor and when the machine is used for hauling it is reversed and runs backward. The seat swings around the steering column and the caster wheel, which is behind when plowing, is in front when hauling. Taken from any point of view the Advance-Rumely 8-16 is unusual.

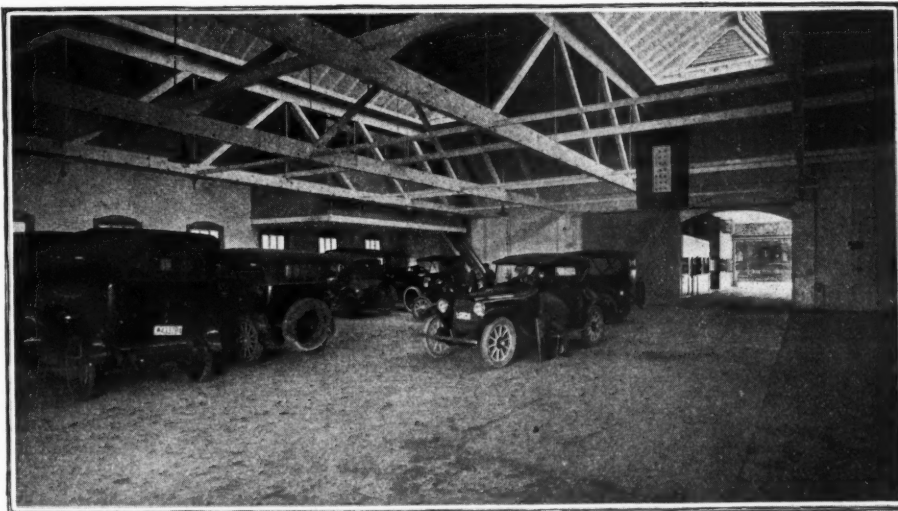
The motor car display at the fair was in an immense tent, with an annex tent for motor trucks and commercial cars. In all there were seventy-eight separate exhibits, with sixty concerns exhibiting. The motor car exhibit was put on by the Indianapolis Automobile Trade Association, which maintained headquarters on the ground, in charge of Assistant Secretary John B. Orman. An isolated exhibit which attracted a good deal of attention was the Amos log loader, displayed on a Packard truck.



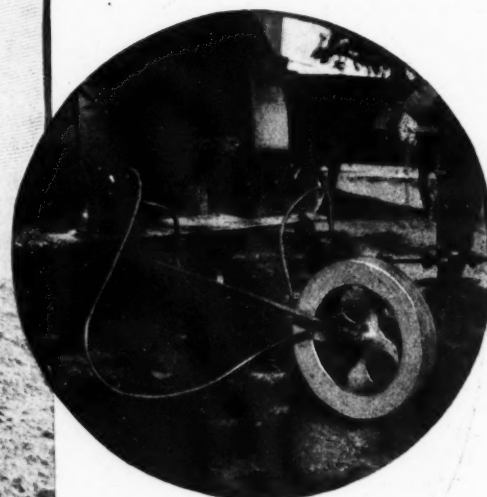
The battery room accommodates 2000 batteries. Some three-tier tables are used



A driveway wide enough for three cars to pass is provided. The alcove contains showcase and counter, where all parts are sold



The service room is 80 by 100 ft., and clear space for fifty-two cars is there. Other features of this room are washroom for employees, mezzanine floor in left corner and shower baths



Testing draft of Oliver two-bottom engine gang pulled by Lauson tractor with Hyatt dynamometer. Close-up of dynamometer, right

## Tests for Side Drafts Held

### First of a Series Conducted with Horse and Tractor Plows

**S**OUTH BEND, Ind., Sept. 6—There was concluded here to-day the first of a series of tests to determine the effect of side draft upon plow draft. For the first time a really scientific investigation, with apparatus adequate to the importance of the subject, has been undertaken to determine just how much the draft of horse-drawn sulky and gang plows and how much the draft of engine gang plows are increased by hitching to the plow off the center line of draft of the plow. That this has been a factor of great importance in the total draft of plows of all kinds has been well known for a long time, but no satisfactory attempt ever before has been made to solve the problem of just how great a factor side draft really is. When the complete series of tests begun this week is concluded it is believed that much light will have been thrown upon this important matter.

#### Cause of Draft

What makes a plow draw hard? In other words, what are the things which go to make up what is known, among plow men, as draft? Draft is the thing which tests the metal of a tractor, for instance. It is what every man who buys a tractor must think about and think about in the right way. If he does not he is very likely to find out some day that the tractor he bought because somebody told him that it would pull an engine gang plow of three bottoms will not pull more than two, and has something of a time doing even that. He finds out then he has gone up against this mysterious thing called draft, and it is knocking all his nice preliminary calculations into a cocked hat. Of course, he wants to know what manner of thing this is which he is up against. What is this plow draft, and why is it that it is so much greater at one time than it is at another?

The buyer is not the only one who wants

to know. The plow manufacturer wants to know also. The latter wants to know what it is so that he can shape his shares and his moldboards and fix his hitch so that it may be overcome as much as possible. The plow manufacturer knows that draft is something he cannot evade. It is just as certain as death and taxes. But as he hopes to postpone the one and cut the latter as low as he consistently can, so also he wants to cut down the total draft on his plow as much as he can. He knows, too, that the amount of draft has no relation to the quality of work his plow will do. In fact, sometimes the best grade of work is done with the greatest expenditure of effort. The better the plowing the heavier the plow pulls. At the same time, if in any way the amount of draft can be reduced without in any way affecting the quality of the work done, then it is an advantage both to him and to the man who buys his plow. Also, when this can be accomplished more men will be likely to buy his particular plow if he can do just as good work as the other fellow with a smaller expenditure of power.

The tractor manufacturer is equally interested. He builds a tractor and fits it with a drawbar primarily to pull plows. He knows that plowing is to be the principal and heaviest work his tractor will be called upon to do. He designs his tractor so that a certain proportion of the power developed by the engine shall be manifested at the drawbar as pulling power. He estimates this pulling power as the equivalent of the pulling power of a certain number of horses under constant conditions of speed and so forth. For this reason he measures the pulling power of his tractor at the drawbar at a speed of  $2\frac{1}{2}$  m.p.h. and he says that his machine pulls as much as will eight or ten or twelve or fifteen horses under the same conditions.

Then the tractor manufacturer tells the man to whom he sells his machine that it has pull enough at the drawbar to pull two or three or four bottoms through the ground. He actually believes that his tractor will do as he says it will, and so he is honest with himself and with his customer when he sells a tractor on such representations. The customer believes it also. So the latter goes ahead, let us say, with his supposedly three-bottom tractor and he finds some time that what the manufacturer believed and what he also believed is not always so. Mr. Draft bobs up and says, "Nothing doing. I'm here. You can't lose me." So the man who bought the tractor lays the blame on it and he goes after the manufacturer and asks him what he thinks he is trying to put across. It does not do any good then for the manufacturer to lay the blame on draft. Of course, draft is the cause of the trouble, but then the tractor manufacturer should have anticipated some such thing and have allowed for it. So the tractor manufacturer, too, wants to know what draft is, how it manifests itself and how it is caused, why it is greater at one time than it is at another and what reserve he must have in his tractor to meet it.

#### Some Causes Simple

Some of the things which cause draft in a plow are simple and are easily accounted for. Such is the weight of the plow itself, for instance. Then there is the resistance which is offered by various kinds of soil to the passage of a plow bottom through them. An infinity of experience has established this within narrow limits. This has been determined per square inch of furrow slice so that it is easy to ascertain how much resistance a bottom of given size will encounter when cutting a furrow slice out of any particular kind of soil. Also it has been determined with a reasonable degree of ap-



proximation how the shape of the moldboard, whether stubble, general purpose or breaker, affects draft. All these things are relatively simple and may be roughly approximated, nearly enough anyway for all practical purposes. So it usually is possible to say that under given conditions about so much power will be required to move one or more bottoms at a certain normal speed through soil of such and such a character. If there were nothing more to plow draft than these things, there almost never would be any trouble.

But there are other things. Several other things, in fact. One of them, and one of large but unknown importance, is what is known as side draft. There is a certain center line of draft for every plow. If this center line can be found and if the pull can be applied directly along this line, then it is plain that the plow will pull easier than it will if the pull is exerted at an angle. The difference between the amount of power required to pull a plow with the pull applied along the center line of draft and the power required when it is applied at an angle, when the plow itself must move along a certain definite straight line, is the amount of side draft there is at any particular time. This may be much or little, as the case may be, but always it increases the draft of the plow and at times may increase it so much that all calculations based upon the simple and known factors of plow draft may be put entirely out of joint.

#### Construction Differs

It happens, too, that tractors are variously constructed. Some are built so that a straight line may be drawn through the powerplant, the transmission, the drive wheel, the drawbar and the center line of draft of the plow. This is an ideal condition, as it eliminates the matter of side draft entirely, but it is rarely attained. Most tractors are so built that the center line of pull of the tractor comes to the left more or less of the center line of draft of the plow, even where one of the wheels of the tractor runs in the furrow, and especially where all the wheels run on the land, and thus some degree of side draft is inevitable. Inasmuch as the furrows about to be turned have no lateral adjustment, that is, they are fixed and cannot be moved from side to side, it must be evident that the plow to turn them in a straight line ordinarily must be pulled from some point outside the center line of draft. Side draft follows and the total draft is increased over the normal by just the amount of the side draft.

It must be plain that this brings up the subject of hitches. The object of a hitch between the tractor and the plow is not alone to pull the plow but also to overcome this side draft as much as possible. But to overcome anything requires an effort. Hence the overcoming of side draft and the forcing of the plows to move in the direction of their center line of draft, irrespective of the fact that they are pulled at an angle, makes them pull harder. How much harder is the problem the farmer, the plow maker and the tractor manufacturer all would like to know because all are equally interested in it, albeit, in a different way.

This important problem never yet has

been solved but is in process of solution now. The illustrations herewith show the first of a series of interesting experiments which have for their object the determination of how much side draft increases the total draft of plows and how plows, tractors and hitches must be devised to overcome this increase and cut the draft of plows down to where it will be as little as possible in excess of what it would be were it possible always to pull a plow along its center line of draft.

The tests depicted in the illustrations took place at South Bend, Ind., and both horse and tractor-drawn sulky and gang plows were used. Specially designed dynamometers, one belonging to the University of Illinois and the other to the Hyatt Roller Bearing Co., were employed. The tests were conducted under the supervision and according to the schedule of Prof. E. A. White, Department of Farm Mechanics, University of Illinois, assisted by F. N. G. Kranich and L. S. Newman, Hyatt Roller Bearing Co., and expert plowmen of the Oliver Chilled Plow Co.

Identical tests will be conducted at the factories of several of the other tractor plow makers. At the conclusion of the tests the results will be collated, and it is hoped there may result a definite determination of just the extent to which plow draft is affected by the side draft induced by hitching off the center line of draft of plows. Tests will be made on both horse and tractor plows.

In making the tests the wall of the last furrow turned is taken as zero. The engine gang plows to be tested all are of 14-in. size and are of two, three and four-bottom types. Six tests will be made of each of the two and three-bottom plows and eight of the four-bottom plow. In test No. 1, with the two-bottom plow, the hitch is on the middle line of the last furrow turned, or 7 in. to the right of the furrow wall. In the scheme of tests this is designated as minus 7. The point of hitch in subsequent tests of the same series is moved to the left to plus 7, 14, 19, 24 and 35 in. consecutively, and the amount of draft for each hitch measured by the dynamometer. The first point of hitch with the three and four-bottom gangs is on the line of the furrow

wall, or zero. The movement of the hitch to the left in each subsequent test is indicated by the schedule which follows:

#### SERIES (F)

Oliver No. 78 Tractor Plow.. Two 14-in. bottoms.	
Test No. 1.....	Hitch 7 inches
Test No. 2.....	Hitch 7 inches
Test No. 3.....	Hitch 14 inches
Test No. 4.....	Hitch 19 inches
Test No. 5.....	Hitch 24 inches
Test No. 6.....	Hitch 35 inches

#### SERIES (G)

Oliver No. 78 Tractor Plow. Three 14-in. bottoms.	
Test No. 1.....	Hitch 0 inches
Test No. 2.....	Hitch 14 inches
Test No. 3.....	Hitch 21 inches
Test No. 4.....	Hitch 26 inches
Test No. 5.....	Hitch 35 inches
Test No. 6.....	Hitch 42 inches

#### SERIES (H)

Oliver No. 79 Tractor Plow. Four 14-in. bottoms.	
Test No. 1.....	Hitch 0 inches
Test No. 2.....	Hitch 14 inches
Test No. 3.....	Hitch 21 inches
Test No. 4.....	Hitch 28 inches
Test No. 5.....	Hitch 33 inches
Test No. 6.....	Hitch 38 inches
Test No. 7.....	Hitch 45 inches
Test No. 8.....	Hitch 52 inches

The results of the tests will not be made public until all have been made, not only at the Oliver plant but at all the other factories. However, this much has been determined already: The draft shows a marked increase for all hitches off the center line of draft, but whether this can be shown to conform to a law expressible in an equation can be determined only after all the tests shall have been made and the results collated.

#### Other Factors

Of course, sight is not lost of the fact that other factors besides weight of plow, size of plow bottom, shape of moldboard, character of soil, speed of plowing and side draft enter into the problem of plow draft. But the remaining factors relatively are negligible when these more important ones have been determined. Some of these already are known. Side draft, however, has been a factor of unknown value. The series of tests undertaken by Professor White, with the co-operation and assistance of the plow manufacturers, bids fair to resolve this unknown factor of side draft, hence its extreme importance to everyone interested in power plowing, from the manufacturer of tractors down to the man who turns the furrows.



University of Illinois dynamometer, carried on truck behind horse-drawn sulky plow. The big wheel is geared to the dynamometer and measures the distance

# Piston Displacement Chart of Eight-Cylinder Engines

Motor Age Maintenance Data Sheet No. 3

BORE—INCHES																					
STROKE—INCHES	2½	2⅞	3	3⅛	3¼	3½	3⅝	3⅞	4	4⅛	4¼	4½	4⅝	4⅞	5	5⅛	5¼	5½	5⅝	5⅞	6
	96.2	103.1	108.2	113.4	118.8	124.2	129.8	135.5	141.3	147.2	153.1	159.0	165.0	171.0	177.0	183.0	189.0	195.0	201.0	207.0	213.0
	103.1	108.3	113.6	119.1	124.7	130.4	136.3	142.3	148.3	154.3	160.3	166.3	172.3	178.3	184.3	190.3	196.3	202.3	208.3	214.3	220.3
	108.0	113.4	119.0	124.8	130.6	136.7	142.8	149.1	155.4	161.7	168.0	174.3	180.6	186.9	193.2	199.5	205.8	212.1	218.4	224.7	231.0
	112.9	118.6	124.5	130.4	136.6	142.9	149.3	155.9	162.6	169.4	176.2	183.0	189.8	196.6	203.4	210.2	217.0	223.8	230.6	237.4	244.2
	117.8	123.8	129.9	136.1	142.5	149.1	155.8	162.6	169.6	176.8	184.1	191.5	199.1	206.8	214.7	222.7	230.9	239.1	247.3	255.5	263.7
	122.7	128.9	135.3	141.8	148.5	155.3	162.3	169.4	176.7	184.1	191.7	199.5	207.4	215.4	223.6	232.0	240.5	249.0	257.5	266.0	274.5
	127.6	134.1	140.7	147.5	154.4	161.5	168.8	176.2	183.8	191.5	199.4	207.5	215.7	224.0	232.6	241.3	250.1	258.9	267.7	276.5	285.3
	132.5	139.2	146.1	153.1	160.3	167.7	175.3	183.0	190.8	198.9	207.2	215.4	224.0	232.7	241.5	250.6	259.7	268.8	277.9	286.9	296.0
	137.4	144.4	151.5	158.8	166.3	173.9	181.8	189.7	197.9	206.2	214.7	223.4	232.3	241.3	250.5	259.8	269.4	279.1	288.9	299.0	309.2
	142.3	149.5	156.9	164.5	172.2	180.1	188.2	196.5	205.0	213.6	222.4	231.4	240.6	249.9	259.4	269.1	279.0	289.1	299.3	309.7	320.3
	147.2	154.7	162.3	170.1	178.2	186.4	194.7	203.3	212.0	221.0	230.1	239.4	248.9	258.5	268.4	278.4	288.6	299.0	309.6	320.4	331.3
	152.2	159.8	167.7	175.8	184.1	192.6	201.2	210.1	219.1	228.3	237.7	247.4	257.1	267.1	277.3	287.6	298.2	309.0	319.9	331.0	342.3
	157.1	165.0	173.2	181.5	190.0	198.8	207.7	216.8	226.2	235.7	245.4	255.3	265.4	275.8	286.3	296.9	307.9	319.0	330.2	341.7	353.4
	161.9	170.2	178.8	187.2	196.0	205.0	214.2	223.6	233.2	243.1	253.1	263.3	273.7	284.4	295.2	306.2	317.5	328.9	340.5	352.4	364.4
	166.8	175.3	184.0	192.8	201.9	211.2	220.7	230.4	240.3	250.4	260.8	271.3	282.0	293.0	304.2	315.5	327.1	338.9	350.9	363.1	375.5
	171.8	180.5	189.4	198.5	207.9	217.4	227.2	237.2	247.4	257.8	268.4	279.3	290.3	301.6	313.1	324.7	336.7	348.9	361.2	373.7	386.5
	176.7	185.6	194.8	204.2	213.8	223.6	233.7	243.9	254.4	265.2	276.1	287.3	298.6	310.2	322.0	334.0	346.3	358.8	371.5	384.4	397.6
	181.6	190.8	200.2	209.9	219.7	229.8	240.2	250.7	261.5	272.5	283.8	295.2	306.9	318.8	331.0	343.3	356.0	368.8	381.8	395.1	408.6
	186.5	195.9	205.6	215.5	225.7	236.1	246.7	257.5	268.6	279.9	291.4	303.2	315.2	327.5	339.9	352.6	365.6	378.8	392.1	405.8	419.7
	191.4	201.1	211.0	221.2	231.6	242.3	253.2	264.3	275.7	287.3	299.1	311.2	323.5	336.1	348.9	361.9	375.2	388.7	402.5	416.5	430.7
	196.3	206.3	216.5	226.9	237.5	248.5	259.7	271.1	282.7	294.6	306.8	319.2	331.8	344.7	357.8	371.1	384.8	398.7	412.8	427.1	441.7
201.2	211.4	221.9	232.5	243.5	254.7	266.1	277.8	289.8	302.0	314.4	327.2	340.1	353.3	366.8	380.4	394.4	408.7	423.1	437.8	452.8	
206.1	216.6	227.3	238.2	249.4	260.9	272.8	284.6	296.9	309.4	322.1	335.1	348.4	361.9	375.7	389.7	404.1	418.6	433.4	448.5	463.8	
211.1	221.7	232.7	243.9	255.4	267.1	279.1	291.4	303.9	316.7	329.8	343.1	356.7	370.6	384.7	399.0	413.7	428.6	443.7	459.2	474.9	
215.9	226.9	238.1	249.8	261.3	273.3	285.6	298.2	311.0	324.1	337.5	351.1	365.0	379.2	393.6	408.2	423.3	438.6	454.1	469.9	485.9	
220.9	232.2	243.5	255.2	267.3	279.5	292.1	304.9	318.1	331.5	345.1	359.1	373.3	387.8	402.6	417.5	432.9	448.5	464.4	480.5	497.0	
225.8	237.2	248.9	260.9	273.2	285.8	298.6	311.7	325.1	338.8	352.8	367.1	381.8	396.4	411.5	426.8	442.6	458.5	474.7	491.2	508.0	
230.7	242.4	254.3	266.8	279.1	292.0	305.1	318.5	332.2	346.2	360.5	375.0	389.9	405.0	420.5	436.1	452.2	468.5	485.0	501.9	519.0	
235.6	247.5	259.8	272.3	285.1	298.2	311.6	325.3	339.3	353.6	368.1	383.0	398.2	413.6	429.4	445.4	461.8	478.4	495.3	512.6	530.1	
240.5	252.7	265.2	277.9	291.0	304.4	318.1	332.1	346.3	360.9	375.8	391.0	406.5	422.3	438.4	454.7	471.4	488.4	505.7	523.3	541.1	
245.4	257.8	270.8	283.6	296.9	310.6	324.6	338.8	353.4	368.3	383.5	399.0	414.8	430.9	447.3	463.9	481.0	498.4	516.0	533.9	552.2	
250.3	263.0	276.0	289.3	302.9	316.8	331.1	345.6	360.5	375.8	391.4	406.9	423.1	439.5	456.2	473.2	490.7	508.3	526.3	544.6	563.2	
255.2	268.2	281.4	294.9	308.8	323.0	337.6	352.4	367.5	383.0	398.8	414.9	431.4	448.1	465.2	482.5	500.3	518.3	536.8	555.3	574.3	

STROKE—INCHES	3⅛	3½	3⅝	4	4⅛	4¼	4½	4⅝	4⅞	5	5⅛	5¼	5½	5⅝	5⅞	6	6⅛	6¼	6½	6⅝	6⅞
	319.6	330.2	340.9	351.7	362.5	373.4	384.3	395.3	406.3	417.3	428.3	439.3	450.3	461.3	472.3	483.3	494.3	505.3	516.3	527.3	538.3
	331.0	342.0	353.1	364.2	375.3	386.4	397.5	408.6	419.7	430.8	441.9	452.9	464.0	475.1	486.2	497.3	508.4	519.5	530.6	541.7	552.8
	342.5	353.8	365.3	376.8	388.3	399.8	411.3	422.8	434.3	445.8	457.3	468.8	480.3	491.8	503.3	514.8	526.3	537.8	549.3	560.8	572.3
	353.9	365.6	377.5	389.4	401.3	413.2	425.1	437.0	448.9	460.8	472.7	484.6	496.5	508.4	520.3	532.2	544.1	556.0	567.9	579.8	591.7
	365.3	377.4	389.8	402.1	414.8	427.8	440.7	453.9	467.4	481.0	494.9	508.8	522.7	536.6	550.5	564.4	578.3	592.2	606.1	620.0	633.9
	376.7	389.1	401.8	414.7	427.7	441.0	454.5	468.1	482.0	496.1	510.3	524.4	538.5	552.6	566.7	580.8	594.9	609.0	623.1	637.2	651.3
	388.1	400.9	414.0	427.2	440.7	454.4	468.2	482.3	496.6	511.1	525.8	540.6	555.4	570.2	585.0	599.8	614.6	629.4	644.2	659.0	673.8
	399.5	412.7	426.2	439.8	453.7	467.7	482.0	496.5	511.2	526.1	541.3	556.4	571.5	586.6	601.7	616.8	631.9	647.0	662.1	677.2	692.3
	411.0	424.5	438.4	452.4	466.8	481.1	495.8	510.7	525.8	541.2	556.7	572.5	588.5	604.8	621.2	637.9	654.8	671.9	689.2	706.8	724.5
	422.4	436.3	450.5	464.9	479.8	494.4	509.5	524.9	540.4	556.2	572.2	588.4	604.9	621.8	638.5	655.6	673.0	690.9	708.4	726.5	744.6
	433.8	448.1	462.7	477.5	492.5	507.8	523.3	539.0	555.0	571.2	587.7	604.3	621.2	638.4	655.7	673.3	691.2	709.3	727.6	746.1	764.6
	445.2	459.9	474.9	490.1	505.5	521.2	537.1	553.2	569.6	586.3	603.1	620.2	637.6	655.2	673.0	691.1	709.4	727.9	746.7	765.7	784.7
	456.6	471.7	487.1	502.6	518.7	534.5	550.9	567.4	584.2	601.3	618.6	636.1	653.9	672.0	690.3	708.8	727.6	746.6	765.9	785.4	804.9
	468.0	483.5	499.2	515.2	531.4	547.9	564.6	581.6	598.8	616.3	634.0	652.0	670.3	688.8	707.5	726.5	745.8	765.2	785.0	805.0	825.0
	479.5	495.3	511.4	527.8	544.4	561.3	578.4	595.8	613.4	631.4	649.5	667.9	686.6	705.6	724.8	744.2	764.0	783.9	804.2	824.7	844.7
	490.9	507.1	523.6	540.3	557.3	574.6	59														



## Colorado Return Loads

### System of Motor Truck Transportation Expands with Five Lines

#### Bureaus Are Educating Farmers and Merchants

DENVER, Col., Sept. 6—The return load system of motor truck transport is being built up efficiently in Colorado under the direction of the highways transport committee of the Colorado State Council of Defense. Five motor truck lines, covering 30 to 70 miles, are handling a substantial amount of return load business. Although the two-way haulage has not yet become extensive for every trip, the educational campaign and other efforts of the committee are counted upon to bring this rapidly to where it belongs, and also to accomplish the same profitable and needed service for scores of other lines now operating almost entirely on a one-way basis. The committee has established return loads bureaus in twenty-two towns in eastern Colorado, and will organize the western half of the state as rapidly as possible.

Two of the lines now doing considerable return-load transporting are between Denver and Fort Collins, 70 miles. The other three are between Denver and Evergreen, 30 miles; Denver and Greeley, 56 miles; Colorado Springs and Pueblo, 45 miles. There are intermediate shipping points and thickly settled farming communities along all these routes.

#### Location of Bureaus

The return load bureaus already organized are at Denver, Fort Collins, Loveland, Berthoud, Longmont, Greeley, Sterling, Fleming, Haxtum, Holyoke, Julesburg, Sedgwick, Fort Morgan, Brush, Pueblo, Rocky Ford, La Junta, Lamar, Las Animas, Colorado Springs, Limon and Hugo. Sterling, Greeley, Fort Collins, Denver, Colorado Springs and Pueblo are district headquarters, covering one to twenty-one counties each, with general supervision of the remaining bureaus in the districts. Additional bureaus will be organized in practically all these districts, besides those yet to be appointed in the three districts of western Colorado. The district boundaries are practically the same as those of the present state highway districts, and all the motor transport routes are being developed in connection with main state highways definitely established.

Educating farmers and business men to cut shipping expenses by using motor trucks both ways is one of the chief duties of the return load bureaus. This plan will benefit everybody concerned, the committee points out, because it will insure the truck lines reasonable profits while at the same time giving the shippers lower rates, will promote community co-operation and increase the dependability of motor truck transport as a regular industry.

A blanket rate for one-way hauling has been worked out by the transport committee on the basis of half the combined railroad freight rate and railroad express rate

between two given points. This has been found to provide a fair profit for the truck lines and also to give shippers and consignees the benefit of express service—in some cases with even more prompt delivery than furnished by railroad express—at less than railroad express rates. As soon as sufficient return load business can be established on a daily basis, this motor express rate can be reduced and still give the motor transport lines a reasonable profit.

While the transport committee now has no authority to dictate any rates, the recommendation of this blanket plan above outlined for one-way haulage has been acceptable in all cases thus far. A legal system of rates is one thing the committee will strive to have established by proper state legislation or necessary Federal authority. Two other main points of achievement aimed at are authority to issue licenses to restrict the number of motor transport lines and regulate their operations, and extensive improvement of Colorado's system of highways.

#### Results Are Favorable

Thus far, favorable results are being accomplished by persuasion and advice. For example, the committee advised against starting a motor transport line where conditions do not look yet ready to insure a reasonable profit, where a truck line already in operation is giving satisfactory service and has sufficient capacity to handle all the business at present. Such advice is based upon as complete information as the committee has been able to gather concerning a particular territory from a comprehensive system of questionnaires sent out to truck dealers, farmers and business men directly interested in shipping problems and in position to know the exact conditions existing in their own community. Again, if a certain section has more truck lines than conditions justify, the committee seeks to get one or more lines to transfer to another section clearly needing such service and offering far better chances.

With an area of nearly 104,000 square miles, equal to that of New York, Ohio, Connecticut and New Hampshire combined, vast stretches of mountainous territory and a widely scattered population totaling only about a third that of Chicago, Colorado presents an exceptionally difficult problem in motor transport development.



This windshield sticker is distributed by the Cleveland Automobile Club to members and their friends

## The Driver Is Cultivated

### Truck Seller Keeps in Touch with Operator for Sake of Service

#### Unusual School Meets Monthly in Wichita, Kan.

WICHITA, Kan., Sept. 6—Sales and service go hand in hand with the Wichita Automobile Co., Wichita, Kan., which handles Reo trucks.

The company has a definite way to go about keeping owners satisfied and the trucks in use. It cultivates the drivers. Every driver of a new truck is given all the instruction he will take. But the process does not stop there. The company keeps in close touch with all the drivers—it knows just who is driving each Reo in the district, and just what kind of work he is doing. Many of the drivers appreciate this service at its full value and take advantage of it. Some are negligent; they think they can get along all right themselves, and occasionally even resent the inference that they need any help. But that does not discourage the company. It keeps after him just the same, finding out what he is doing and figuring out some way of "getting under his skin" so that he will come around once in a while to discuss truck operation and receive explicit suggestions on caring for his machine.

#### School for Drivers

A few months ago the company, finding that the increasing number of trucks in the territory provoked difficulties maintaining personal contact with the drivers, established a school at its headquarters. It was not put up to the drivers as a technical training enterprise to teach the elements of truck operation. It was more in the form of an association or a periodical party for the drivers. Social features were provided, and a souvenir was given to each attendant, by which he might remember the occasion. The sessions have included talks by service men of the company on lubrication, and driving, discussions of questions brought up of specific troubles encountered and special conditions of work that need unusual handling. Frequently most of the troubles of the drivers have been brought out in open meeting, though at each session there are a few drivers who take up their knotty problems personally with the service men.

The records show that in the last five months every driver on the company's list has attended at least one of these meetings. More than 50 per cent attend all. They are held about once a month, though not at regular intervals.

The success of the policy of keeping in touch with drivers prompted the publication of "The Reo Bulletin," a four-column one-page breezy sheet, issued "every little while" and sent to all drivers. It carries short stories of specially interesting work being done by Reos, personal items about members of the company's organization and suggestion on the care of trucks. It also advertises the used trucks which the company may have for sale.

# Maintenance of Rear Axles

## No. III—Torbensen Care and Adjustments

THE Torbensen rear axle comes in several different types, differing primarily in the carrying capacities and slightly different form of brake operating. Hence the cross-sectional view herewith will suffice for all types so far as general maintenance and adjustment is concerned.

### Lubrication

When Torbensen axles are shipped from the factory they come to the user with only sufficient lubrication to prevent the bearings from rusting and to permit the inspection test. It is necessary, therefore, that the user supply lubrication and inspect the axle to make sure no dirt or other foreign matter has found its way into the bearings and grease cases.

After the first 1000 miles the internal gear cases and the differential gear casing should be drained of all oil and grease and washed out with kerosene or gasoline. They then should be given a new application of lubricant. A similar renewal should be made after each 5000 miles. This removes any metallic particles or dirt that may have worked into the cases.

There are six grease cups on the axles; two on the jackshaft bearings, two on the internal brake cams and two on the inside brake brackets. Each of these must be filled with a soft grease or non-fluid oil, and when the truck is in use they should be turned down a half turn each day.

The differential gear box should be charged with lubricant as follows:

Types O and A—1 qt. in warm weather, 1½ qt. in cold weather.

Types C—1½ qt. in warm weather, 2 qt. in cold weather.

Type E—2 qt. in warm weather, 2½ qt. in cold weather.

Do not use a larger quantity, as it will be wasted, but the right amount is absolutely necessary.

In cold weather a lubricant must be used which does not lose its lubricating value in low temperatures. Everyone knows how hard it is to turn over an engine in cold

weather. The lubricants in the engine quickly are warmed up by the heat of the explosions so that they regain their value before the bearings are injured, but there is no such beneficial heat to protect the differential bearings in a rear axle. If the truck is kept in an unheated place for any length of time in cold weather, oils or greases which solidify at low temperatures will cause trouble. This is true of any make of axle or differential.

Ball or roller bearings should be given an occasional application of vaseline. Cheap oils or greases may contain acid, which will rust the cages or balls, or they may contain solid matter which causes rapid wear.

The internal gears should be given a thin coating of semi-liquid oil, grease or graphite mixture. If any more than a light coat is applied, it will be wasted, as it is thrown off into the protecting grease shield, from which it passes off through the drain. One application of grease is enough for one month's use.

The hub is cored out in such a way that a large amount of non-fluid oil can be placed therein. This lubricant works into the bearings and provides a continuous supply.

### Adjustments

It is of great importance that truck axles, no matter what their type, be watched to make sure that they are in proper adjustment. Improper adjustment causes wear.

Means of adjustment are provided for two purposes on the Torbensen axle, to provide the proper center distance for gears and to take up wear. These adjusting devices are provided with locks, which should not be disturbed unless absolutely necessary.

#### Differential

At either side of the differential will be found adjusters, A, which hold the differential jackshaft bearings in the proper relation and which also are used to adjust the bevel pinion and ring gear so that they will mesh properly. These adjusters should not be set up so tightly that they cramp the

bearings. By turning one to the right and the other to the left, it is possible to change the center distances of the ring gear and pinion. When the axles leave the factory this adjustment is made in such a way that there is a slight amount of back lash and the engagement corresponds with the pitch lines of the gears.

#### Bearings and Hubs

If the hubs are removed for the purpose of lubricating or for examining the brakes, it will be necessary to remove the outer bearings. The truck driver, therefore, should be competent to replace these bearings. This adjustment is simple.

First—Screw up the round nut B until it is moderately tight, then unscrew it half a turn.

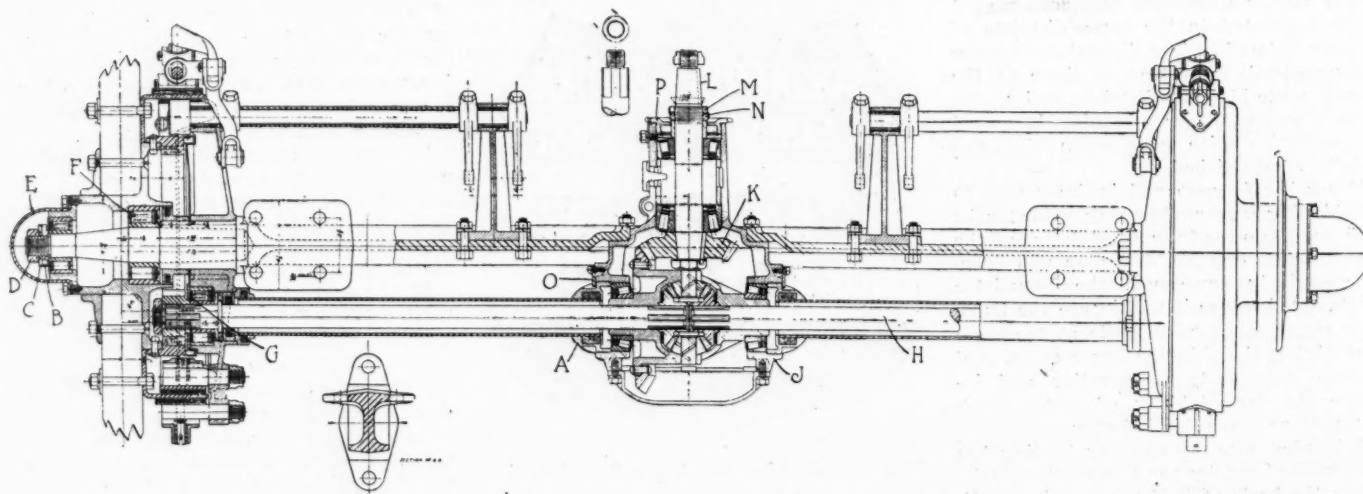
Second—Slip on the perforated washer, C, and see that the projecting rivet or pin in nut B fits into one of the corresponding holes in the washer C.

Third—Screw up the castellated nut D until it is tight. Rotate the wheel by hand a few times, then draw the nut D up tight again, back it off a very slight amount to enable freedom of rotation and secure nut with cotter pin.

These instructions apply to both the straight roller and taper roller types of wheel bearings.

### Taking Down Axle

To disassemble the axle, first remove the hub cap E. Remove the cotter pin and unscrew the castellated nut D. The perforated tongue washer then can be removed and the round nut B unscrewed. The wheel now can be pulled straight off the hub spindle. If it does not come off easily, it should be removed by the use of the company's special wheel puller, which is made to fit over the hub in place of the hub cap. The hub can be pulled off very easily by turning the set screw in the wheel puller. If it is desired to remove the inner roller bearing F, it should be done carefully. Do not use a chisel or pry it in such a way that any strain will be thrown on one side or the



Sectional view of the Torbensen internal gear drive axle, showing the location of adjustments and general details of construction



other of the shell, as it will not stand such strain.

The internal gear, which is riveted to the hub, then can be inspected. If it is desired to take down the differential carrier, the first step is to take down the jackshaft to which the spur pinion is keyed. This is done by removing the flange G, which is held in place by two bolts. The jackshaft then can be pulled out by hand. After both jackshafts, H, are removed the differential can be taken out of its housing by removing the rear half of the differential carrier J, which is held in place by six studs and nuts. Removal of the differential makes it possible to examine the driving pinion K and the shaft L. The driving pinion and shaft then can be removed by unscrewing the lock nut M, taking the shaft through the rear of the carrier. The construction of the axle is such that any other parts can be handled without special instruction.

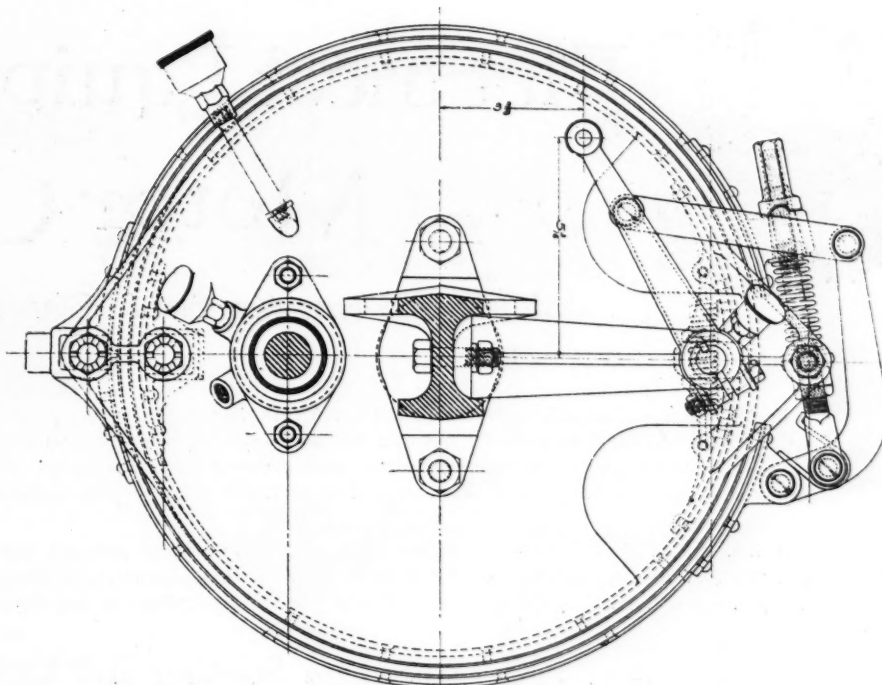
#### Assembling the Axle

To assemble the axle again special attention must be given to obtain proper adjustment of the bearings and differential gears. These adjustments should be made by a mechanic familiar with such work. The adjustment of the taper roller bearings on driveshaft L is made by setting up inner nut M moderately tight, and then turning it back and forth to half a turn, which will permit of a barely perceptible play, or shake, in the bearings. Then draw up the outer jam nut M very tight and lock both nuts in place by bending over the prongs of the washer N. One of these prongs should be bent flat against the side of each nut.

The taper roller bearings on each side of the differential are adjusted in a similar manner and must be given a small amount of play. These adjusters are locked in place by piece O, which fits into a notch on the bearing adjuster A. The pinion felt retainer P, which is located at the front end of the differential carrier, is locked in place by a set screw which must be removed before the washer can be unscrewed. Whenever the axle is taken down care must be taken to get all the locking devices in place or serious damage may result.

The trucks which use Torbensen war axles and the types used follow:

TRUCK NAME	TRUCK MODEL	AXLE TYPE
Bessemer	G	A
Bessemer	I	A
Bessemer	J	C
Bessemer	K	E
Commerce	E	A
Douglas	1-1½-ton	A
Grant	12	OX-2
Grant	10	A
Grant	15	C
Hahn	C	A
Hahn	E	C
Panhard	A	OX-2
Panhard	3000-lb.	A
Republic	Dispatch	O-2
Republic	Special	O-2
Republic	10	A
Republic	11X	C-2
Republic	12	C-2
Republic	T	E
Union	3½-ton	E
United	tractor-truck	C
Koehler	K	A
Koehler	L	C
Koehler tractor	KT	A
Koehler tractor	LT	C
Luverne	17	A
Lapeer	tractor-truck	A
Lapeer	tractor-truck—5-ton	C
Knox	5-ton tractor-truck	C
Knox	3-ton tractor-truck	A
Knox	2-ton tractor-truck	OX
Master	M	C
Master	tractor	C
Muskegon	4000-lb.	C
Palmer	2000-lb.	A



Torbensen rear axle brake used on the type A axle, showing both sets of brakes and operating linkage

Palmer	4000-lb.	C
Superior	A	A
Superior	C	C
Defiance	3000-lb.	A
Schwartz	1-½-ton	A
Schwartz	2-½-ton	C
<b>Attachments</b>		
E & W	1-ton	OX-2
E & W	1-1½-ton	A
E & W	2½-3-ton	C
Graham	U	A
Graham	2½-3-ton	C
Luverne	U	A
Lauton	1-ton	OX
Lauton	1½-2-ton	A

Lauton	2½-3-ton	C
Tonford	1-ton	O
Tonford	1½-2-ton	A
Phenix	1-ton	O
Phenix	1½-2-ton	A
Browntruck	1½-2-ton	A
Burman	1½-2-ton	A
Truckford	1-ton	O
Truckford	1½-2-ton	A
Utility	1-ton	O
Utility	1½-2-ton	A
Partford	1-ton	O
Partford	1½-2-ton	A
NewComer	1-ton	O
NewComer	1½-2-ton	A

## "This Side Up" and "Handle with Care"

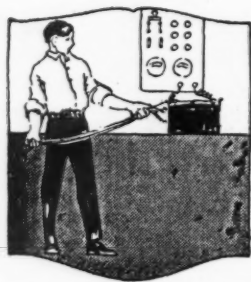
### How U. S. Planes Are Shipped Overseas

WASHINGTON, Sept. 6—Shipments overseas of American-built airplanes have been considerably improved by the Aircraft Production Board as the result of studies in plane boxing and shipping problems. Shipments of American de Havilland bombing planes, for example, is now made saving 644 cu. ft. over the former methods for each airplane sent. This amounts to a cost saving of \$3,564 per plane, figuring shipping space at \$6 a cubic foot. In addition, 1000 board feet of lumber is saved.

Nine packing boxes are used to ship four battleplanes. The gross weight of the four planes is 11,000 lb. and, when packed, 27,000 lb. Four of the nine boxes contain front sections of the fuselage. One contains four rear sections, two hold two sets of wings each; one, four sets of rear controls and one set of ailerons. The total space required for four planes so crated is 3547 cu. ft. In addition to the parts actually required to complete the four planes, spare parts are shipped. Two main wing boxes are sent with each unit shipment of four planes, containing, besides the wings with their fittings, axles, wing skids, landing gears, wiring plates, wheels, tires, struts and fittings. One aileron box is included with each shipment of four planes.

Shipment of spare parts of 100 De Havilland planes requires 105 cases weighing 164 tons. With every plane there are also shipped two Marlin synchronizing machine guns operated by the pilot, two Lewis flexible machine guns operated by the gunner, camera, attachments for radio set, heating and lighting equipment, bombing equipment, air pressure gages, oil pressure gages, aneroid barometer, clock, compass, map case, fire extinguisher, safety belts, Very signaling pistol, etc.

All boxes are lined with water-proof paper and the tops covered with tarred felt fastened down on the sides and ends. All the joints are sealed with cement and the exteriors are given two coats of paint. Minute directions are given for packing the various parts of the airplanes. Braces and supports within the box are so constructed as to support the engine and fuselage. Metal parts which might corrode are protected by a neutral slushing compound which is resistant to the effects of sea air and salt water. The instruments on the instrument board are heavily covered with a coating of paraffin, the more delicate instruments being removed and packed carefully in special boxes, which in turn are sealed in air-tight tin boxes.



# Electrical Equipment of the Motor Car

*By David Penn Moreton & Darwin S. Hatch.*



*Editor's Note—Herewith is presented the 111th installment of a weekly series of articles begun in MOTOR AGE, issue of June 29, 1916, designed to give the motorist the knowledge necessary to enable him to care for and repair any and all of the electrical features of his car, no matter what make or model it may be. At the conclusion of this series, "Electrical Equipment of the Motor Car," with additions, will be published in book form by the U. P. C. Book Co., Inc., New York.*

*A thorough explanation of the fundamentals of electric circuits preceded descriptions of the general types of starting, lighting and ignition apparatus, signalling devices, magnetic transmissions, etc. This is being followed by the installation, care and repair of individual systems, beginning with the special equipment for Fords.*

## Part CXI—Auto-Lite Starting and Lighting Systems.

THE early models of Auto-Lite generators were of the permanent-magnet field type, three sets of tungsten steel horse-shoe magnets being used to produce the magnetic field, as shown in Fig. 596. The armature was made to revolve in the field produced by the permanent magnets by having the armature shaft connected indirectly to the driving shaft by a friction clutch. The driving and driven members of this friction clutch are held in place by springs whose pressure is controlled by the centrifugal force produced by the rotation of two swinging arms. At an

armature speed of approximately 1850 revolutions per minute these arms are revolving swiftly enough to compress the springs which hold the clutch members in contact with each other and thus allow the sprocket, which is being driven by the engine, to revolve independent of the armature shaft of the generator. By this arrangement the armature speed is maintained at about 1850 revolutions per minute no matter how fast the engine may be rotating so long as it is at a sufficient speed to produce 1850 revolutions per minute of the generator. The speed of the generator is about two and a half times that of the engine. It is driven by a silent chain from the crankshaft or any other shaft rotating at the same speed, and its action is entirely automatic. The output of the generator is under normal conditions approximately 12 amperes. This type of Auto-Lite generator is known as the model C.

A second type of Auto-Lite generator is shown in Fig. 597. It will be observed that this machine is of the excited field type. The chief differences between this generator and the permanent-magnet type lie in the method of producing the magnetic field and the fact that the armature revolves at the same speed as the crankshaft in the case of four-cylinder engines and one and a half times crankshaft speed in the case of six-cylinder engines. The fact that this generator is designed to be driven at such high speeds, combined with the additional fact that its base has magneto dimensions, is of immense advantage in installation, as the generator can be placed on the bracket provided on the en-

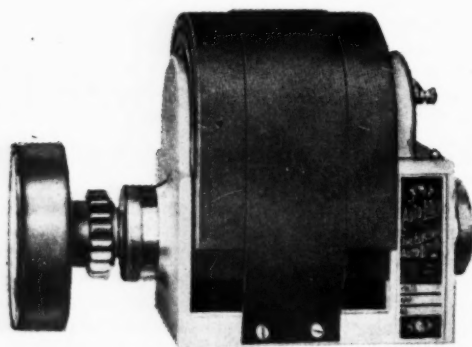


Fig. 596—Model C-60 Auto-Lite generator

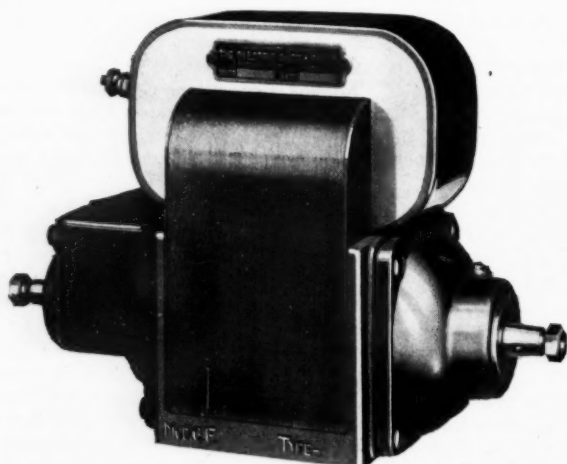


Fig. 597—Model GF Auto-Lite generator

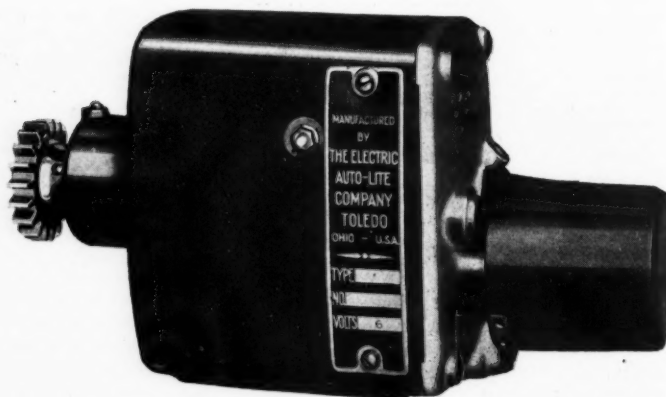


Fig. 598—Model GD Auto-Lite generator



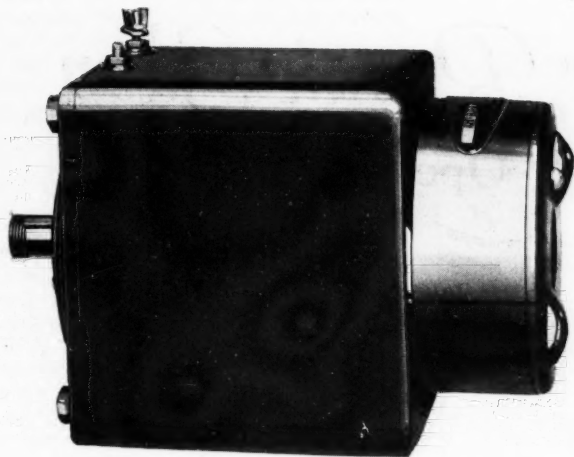


Fig. 599—Model GH Auto-Lite generator

gine for the magneto and driven directly by the magneto shaft. The magneto can be placed back of the generator and driven through it, as both ends of the generator shaft are given the same standard taper used on all magneto shafts.

Two field windings are provided. One is composed of many turns of small wire and is called the shunt winding, while the other is composed of comparatively few turns of large wire and is called the series winding. The shunt winding has a current produced in it which is proportional to the terminal voltage of the generator, since the resistance of the shunt winding remains practically constant. The current delivered by the generator passes through the series winding, since it is connected directly in series. The current in the series winding flows around the magnetic circuit of the generator in the opposite direction to the current in the shunt winding, and as a result their magnetizing actions oppose each other rather than assisting each other. As the current output of the generator increases there is an increase in the magnetizing action of the series field, and as a result there is a decrease in the strength of the magnetic field of the generator and, hence, the output of the generator does not increase as rapidly as it would if there were no weakening effect on the magnetic field due to the action of the series field. The voltage of the generator at approximately 6 miles per hour is such that it starts delivering current and the current output increases in value until a speed of about 20 miles per hour is reached when the current output is in the neighborhood of 12 amperes. Auto-Lite generator models G, GA and GF all are provided with one series and one shunt field coil.

An external view of a third type of Auto-Lite generator similar to the ones just described but having two shunt and two series field coils is shown in Fig. 598. This machine is designed to operate at twice engine speed. It starts delivering current at about 7 miles per hour, and at a speed of about 20 miles per hour it delivers approximately 12 amperes. Auto-Lite generator models GB, GC, GD and GG all are provided with two shunt and two series field coils.

A fourth type of Auto-Lite generator having only two shunt field coils is shown in Fig. 599. The output of this generator is regulated by the third-brush method. It operates at one and a half engine speed, cut in at about 7 miles per hour, and delivers approximately 14 amperes at 20 miles per hour.

### Motors

The following brief description of the starting motor will apply to all types of starting motors manufactured by the Auto-Lite company. The frame is provided with four pole-pieces and four field coils. The brush holder assembly consists of four brush holders stamped out of sheet steel and then copper plated to prevent rusting. The brush holders are assembled on the head of the motor with studs or bolts that go through the brush holder and spring, through the head, and are held by a lock washer and

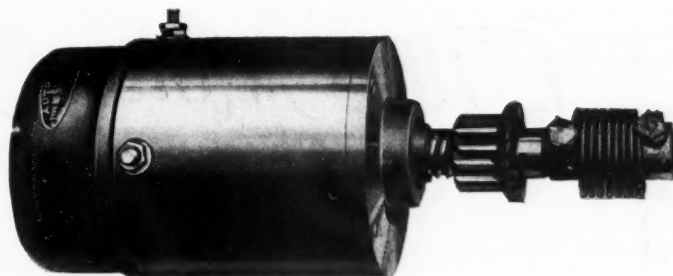


Fig. 600—Model MD Auto-Lite starting motor

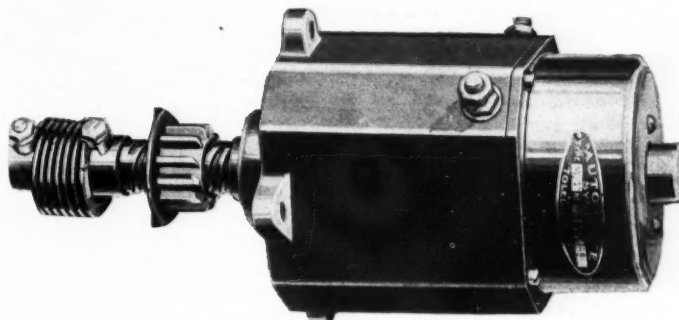


Fig. 601—Model MF Auto-Lite starting motor

unit. The stud is insulated with a fiber washer, a fiber brushing in the head and a fiber washer on the outside. This gives a strong assembly free from mechanical or electrical trouble. The first coil of the field winding is connected to the positive terminal, or insulated terminal on the motor frame. The other side of coil No. 1 is connected to one side of coil No. 2, and the remaining side of coil No. 2 is connected with the brush holders on opposite sides of the commutator through a heavy braided flexible wire. Coil No. 3 is connected to the remaining two opposite brush holders, and the other side of the coil is connected to one terminal of coil No. 4, and the remaining terminal of coil No. 4 is connected to the negative terminal, or grounded terminal, on the motor frame. The armature is wound with heavy wire that is held in place by bands around each end of the winding.

The Bendix drive is used with all the starting motors as a means of establishing the mechanical connection between the motor and engine when the motor is called upon to start the engine. Two different types of Auto-Lite starting motors are shown in Figs. 600 and 601.

### Cutouts

An electromagnetic cutout is used in establishing the connection between the generator and the storage battery when the voltage of the generator has reached a value equal to or preferably a little greater than the terminal voltage of the battery. This connection will remain closed as long as the generator continues to supply current to the battery or lamps, but just as soon as the battery starts to send current back through the generator, which causes the generator to operate as a motor, the cutout, if operating properly, will open the circuit and thus prevent an unnecessary discharge of the battery. The armature of the cutout never should be moved when the generator is not running, as the action of the cutout under these conditions is such that it will keep the circuit between the generator and battery closed in spite of the fact that the battery is discharging, and the result will be a discharged battery and perhaps a damaged generator. If the armature of the cutout is accidentally or otherwise drawn up and the circuit thus closed, the armature should be pried away from the iron core and the circuit opened, or the engine should be started and run at such a speed that the voltage generated in the generator will be ample to counteract the voltage of the battery.

# The Motor Car Repair Shop

## Soldering and Brazing Operations

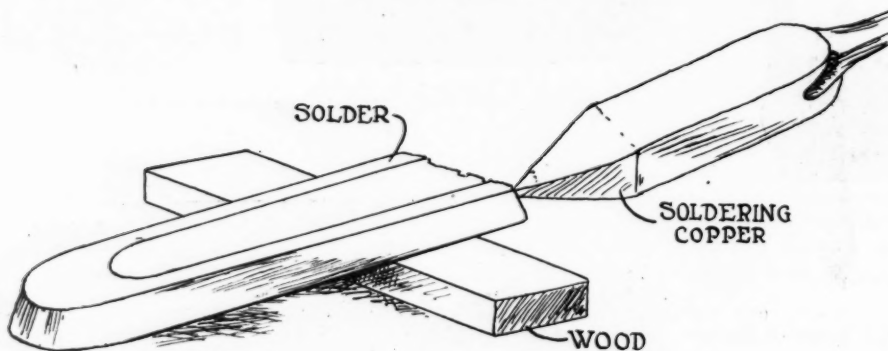


Fig. 1—Brazing flange on manifold. The work is heated in a charcoal fire and the end of tube stuffed to prevent loss of heat



Fig. 2—Three-cornered scraper made from old file and ground as shown in cross-section

**S**OLDERING and brazing operations are going on constantly in repairshops, and while to those not experienced in the work the processes seem simple, the skilled worker along such lines has required his handiness with the soldering copper or brazing outfit only after much practical experience. Soldering is done chiefly on such parts as radiators, etc., while brazing is resorted to in mending broken parts subjected to greater strains and where soft solder is not desirable, or could not be used, as, for instance, brazing a flange on the end of a copper or brass tube.

There are hard and fast rules that must be observed in either soldering or brazing, and the two chief items are that the work must be absolutely clean and enough heat must be applied. You always can tell a poor job of soldering by the lumpy mass of solder piled up around the joint. A lumpy condition shows that not enough heat was used. Soldering with too cool a copper is never a success. When properly heated the solder should flow like water, and if the parts have been cleaned thoroughly the solder will cover the surfaces readily. A thin layer of solder applied to cleaned surfaces will hold much better than a lot of solder piled up around a joint in too cold a condition.

### Scrape Surfaces

It is not sufficient to wipe the surfaces with acid or gasoline to prepare them for soldering. They must be scraped with scrapers, files or emery cloth, and it is best to do this just before soldering, as it gives less chance for oxidization. Many make the mistake of rubbing the surfaces with their fingers to see how smooth it is or to remove dust. This is wrong, as the fingers may be more or less greasy, and grease will prevent the solder from taking hold, owing to the flux not being able to cover properly. A rag or brush should be used to wipe the surface.

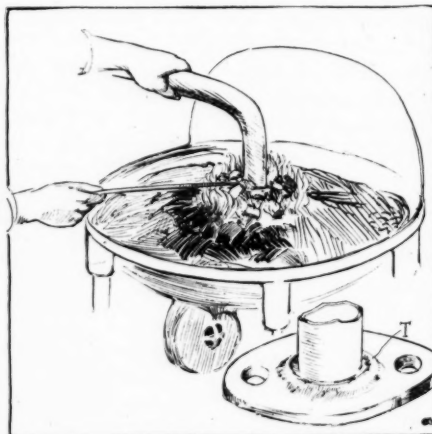


Fig. 3—Taking solder from a bar with the soldering copper. A stick of wood holds the end up properly

Most of the work in the shop can be done with a 2-lb. copper, or soldering iron, as it generally is called. There should be two of these. While one is applied to the work, the other can be heating, and thus there will be no interruption in the work. While, of course, the copper must be heated to a sufficient temperature to cause the solder to melt, the work to be joined must be heated also, or the heat from the copper will be dissipated too quickly. Where only a small surface or spot is to be soldered this is not so important, if the copper is large enough to hold the heat for some time. It is especially on radiators that difficulty will be found with dissipation of heat, owing to the large surfaces. But the heat from the copper can be supplemented in this case by a blow torch or blow pipe. Care is necessary here, for the workman should see that the adjacent parts are not unsoldered.

The copper, or soldering iron, must be tinned to do good work, that is, there must

be a coating of solder on the four faces of the working end and for a distance of about  $\frac{1}{4}$  in. from the point. If the copper looks as though it had been eaten by acid, it means that at some time the copper has been overheated. It should never be heated red hot. An experienced man will heat the iron to what he thinks is about the right temperature and then hold the bit a few inches from his cheek, noting the amount of heat radiating from it. A few trials sometimes will tell one when sufficient heat has been applied.

To prepare the bit it should be heated and placed in a vise and the four surfaces filed bright, being careful to remove the burr that forms on the edges. Immediately upon filing the point should be dipped in and out in a solution of salammoniac and water. Chloride of zinc also is used for this. If, when the iron is taken out of this solution, the faces should become tarnished immediately, it shows that the bit is still too hot for tinning. It then can be dipped in and out of water. Again file the faces quickly and dip in the solution again. If it comes out uncolored, hold a stick of solder on the faces, applying a little on each and dip again in the solution. It will be distributed in this to all parts of the four faces and come nice and bright. It is then ready for soldering. A brand new copper must be heated to a dull red when tinning for the first time.

If the copper is tinned right and the work heated, the actual application of the solder is not so difficult a matter. It simply consists of applying the flux, resin or whatever is used and then the bit which has been previously applied to the solder so that some of it adheres to the bit. The way to take solder from a stick is shown in Fig. 3. The work to be soldered always should be so placed that it is horizontal, so the molten solder will not run off.

Wherever possible the process of sweating should be used. This consists of tinning the parts with the soldering copper and then clamping them firmly together and heating the whole joint with a torch. This has the advantage of applying the heat generally, instead of locally, doing away with the tendency to warping. It is essential in soldering that the work not be hurried. Sufficient time must be allowed to melt the solder. Once it is melted it can be distributed with the bit over the fluxed surface.

### Brazing

Brazing is hard soldering. In this case the parts are heated red hot and instead of using solder spelter is the uniting agent. Borax powder is used extensively in brazing, and clean work can be done if it is handled carefully. A good workman will have the parts thoroughly cleaned and apply the flux or borax only around the joints to be brazed, while a poor one cleans the parts in the vicinity of the joints but fails to clean the joints themselves; then, in the operation of brazing, he sprinkles a large amount of borax and spelter over the parts



instead of applying just enough and in the right place. By dipping the brazed parts in water immediately after the operation of brazing, the scale of the flux will be cracked off or at least loosened.

Hard solder is an alloy of copper and zinc, consists of brass filings and commonly called spelter. To secure perfect union of metal bodies and brass as the agent of combination, heat and flux are the other essentials. There are other conditions quite as important. First, the parts to be united must be clean, just as in soldering, in contact with each other and held together with rivets, clamps, wire or any other means to hold them in proper alignment. Second, the parts must be heated properly, the flux and spelter distributed carefully and all operations performed at the same time.

In Fig. 1 is shown the process of brazing on a flange to a section of tubing. This job was on the water manifold of an engine, and owing to the necessary bends in the tubing, it was necessary for the flange to be in a certain position relative to the length of the manifold and its position on the engine. For this reason, after the manifold had been cut off to the proper length, it was placed on the engine with the end to be brazed resting loosely in the flange and arranged in its ultimate position.

In this position the tubing and flange were marked carefully with a scratch awl, one mark being drawn around the circumference of the tubing and the other at right angles to it, half on the flange and half on the tubing, so that they both intersected at the same point on the line drawn around the circumference. The flange and tubing then were taken off and cleaned with emery cloth. Care was taken not to eradicate the marks. Then the flange was slipped on the manifold so the marks lined up correctly and four holes were drilled at convenient intervals through the boss on

## Lest you forget

Watch your car if you wish to get real service out of it  
Don't neglect the little inspections and adjustments

- |  |  |
|--|--|
| 1 Storage battery inspected every two weeks                                | 10 Valves ground each 5000 miles                                   |
| 2 Grease cups turned up every 100 miles                                    | 11 New piston rings every 15 months                                |
| 3 Springs oiled every week   | 12 See that the wheels are in line once a month                    |
| 4 Oil and gasoline connections inspected every week                        | 13 See that the water is circulating every time the car is started |
| 5 Crank case drained and washed out with kerosene every 500 miles          | 14 Inspect bearings on wheels once a month                         |
| 6 Universal joints packed with grease every 1000 miles                     | 15 Gasoline pipe and carburetor thoroughly cleaned every month     |
| 7 Differential and transmission packed with grease or oil every 1000 miles | 16 Self starter inspected every month                              |
| 8 Spark plugs cleaned every 1000 miles                                     | 17 Inspect steering wheel and steering knuckles once a month       |
| 9 Carbon removed from cylinders twice a year                               | 18 Test brakes and equalize once a month                           |

We are equipped to give you prompt and intelligent service in keeping your car tuned up right.

Your brakes should now be in perfect condition. They are lined with Thermoid, the world's standard brake lining.

After you have run your car for about fifty miles come in and let us examine both brake linings and rods. We shall be glad to do it without charge.

Repair tag reminder for car owner

the flange and tubing and the two riveted together.

To have the job neat and prevent flux and spelter from running over the flange a trough was made around the joint with a composition consisting of a mixture of

shredded asbestos and asbestos glue, or asbestos cement. The flux used in this case was a mixture of borax and boracic acid. It was applied to the joint with a stick. The end to be held in the hand was stuffed with waste to prevent heat from flowing through the tubing and then the job was placed over a charcoal fire. Some of the larger pieces of charcoal were built up around it and the flanged end slowly heated. When it began to take on a red color, a steel rod with the tip flattened and bent at almost a right angle was placed in the fire. In a few seconds both the end of the rod and job had become heated to a light red color; the tip of the rod was removed and a small amount of flux scooped up with the flat portion and applied to the parts.

Two or three doses of the flux applied in this way and carefully distributed were sufficient. The spelter was applied immediately afterward in the same manner. It melted and flowed readily and as soon as it had flowed all around the joint the parts were removed from the fire and cooled.

## Thermoid Repair Tag

The Thermoid Rubber Co. uses a novel means of co-operating with the dealer in seeing that cars leaving the repair shop are tagged in such a manner as to call the owner's attention to those parts of the car requiring periodic attention and thus save many a trip to the shop from having neglected to oil or adjust certain of the car's mechanism.

One side of the tag is shown. It will be noted there are eighteen inspections that every motorist should make regularly to keep the car in perfect condition. Incidentally the dealers look with favor upon these cards, as it refers to items that mean business to them. The other side of the tag states that Thermoid brake lining has been put on the car.

## Chain of Landing Fields 100 Miles Apart War Department Plans for Future Flyers

WASHINGTON, Sept. 6.—A chain of landing fields is being built across the continent at intervals of 100 miles. When they are completed they will be able to supply pilots, oil, gasoline, shelter, machine shop facilities, maps, charts and barometer and thermometer ratings. They are being built in New York, Pennsylvania, Ohio, Illinois, District of Columbia, Georgia, Texas, California, Arkansas, Mississippi, Alabama, New Mexico and Nebraska. The field no doubt will enter largely into the location of future training fields, as they can be used for developing flyers.

Bolling Field, District of Columbia, is to be improved by an expenditure of \$103,150. This field is being used for the aerial patrol and protection of Washington as well as a training field for air service officers located in the Capitol. In addition to hangars and quarters sufficient for twenty-three officers and 154 enlisted men, there will be a balloon station with captive and free balloons for training observers. A photograph-developing hut and a small radio telegraph station also will be features of this field.

The War Department now plans to train flyers in this country in squadrons to be shipped in such form to Europe instead of detachments as heretofore. Forty squadrons have been authorized. Four will be located at Houston, Tex., and thirty-six at Long Island, N. Y.

Maj.-Gen. William L. Kenly, director of the Division of Military Aeronautics, states that this division is speeding up the training of flyers and is making ready to produce whatever number of flyers may be called for.

"Training schools," says General Kenly, "are now being grouped in districts so that the cadet flyers may pass from ground, primary and advanced instruction all in one locality and when the final test is passed be ready for France. It is also the intention as classes of these cadets finish their training as flyers to organize them into squadrons and brigades so that they may be sent overseas as such and take the air at the front in the formation in which they have been trained.

"Our study and observation and also the experience of officer instructors who have

been overseas makes us confident that this country offers the best training ground, not excepting England and France. This is primarily so because we have unlimited room here in the United States. We are now equipping our flying fields with experienced instructors. In England and France the population is so great and uninhabited areas are so few and far between that it is difficult to locate even half a dozen training fields to say nothing of several dozen.

"One of the fields I visited was Mather Field at Sacramento, Cal. This field has a record of 250,000 hr. of flying without a fatality. Another interesting place was the balloon field at Arcadia, Cal., where I saw seven balloons in the air at one time. The site of this field is a ranch back of which mountains rise to elevations the tops of which offer the same atmospheric conditions as the cadet gets suspended high in the air in the balloon basket. By taking the cadets up in these mountain tops, the instructors can train a large number at a time in observation and range-finding work, instead of limiting the classes to a few pairs in balloon baskets."

# The Readers' Clearing House

Conducted by B. M. Ikert

## Oil Pump for Ford Engine

**Q.**—Give sketch of oil pump for Ford. I have seen one operated through side of engine by camshaft. Give address of company handling them.—Reader, Rippey, Iowa.

When the usual Ford oiling system is used for high-speed purposes, trouble usually is encountered, due to the fact that the oil does not flow down the oil tube which is placed inside the crankcase. Ordinarily the oil is splashed up by the flywheel and a certain amount of it caught in the funnel-shaped end of the oil tube which carries it to the timing gears. From here the oil flows to the connecting-rod troughs and back to the flywheel housing. At extreme high speeds the oil does not get to the timing gears properly by the oil tube and some positive means must be employed to make sure that the oil is getting to all parts of the engine.

A suggested oiling system is shown in Fig. 1 and consists of a reservoir placed at any convenient point on the chassis and from which the oil can be pumped to the crankcase by a hand pressure pump. From the crankcase the oil is pumped by a small piston pump, as shown, to a gage on the dash and then to the timing gears. To place the pump on the engine a hole is drilled in the side of the crankcase directly opposite No. 4 exhaust cam, and of sufficient size to allow the head A of the piston to pass through it. The pump parts are made of brass and consist of the tube B screwed into the flange C, the latter be-

ing provided with four holes for cap screws which hold the pump in place. The holes for these cap screws in the crankcase are tapped and a leather gasket placed as shown. The pump piston can be made of steel and is actuated at one end by a coil spring and the exhaust cam on the other. A bushing D is fitted into B to which the

**T**O assist readers in obtaining as a unit all information contained in this department on a certain subject in which they may be most interested, MOTOR AGE segregates inquiries into divisions of allied nature. Questions pertaining to engines are answered under that head, and so on.

### LUBRICATION

Reader.....Rippey, Iowa

#### THE ELECTRIC SYSTEM

H. K. Harris.....Chicago  
H. W. Morton.....Los Angeles, Cal.  
Harry Schroeder.....Sheffield, S. D.  
James W. Werckle.....Peoria, Ill.  
C. D. Ingersoll.....Canton, Ill.  
J. W. Goddard.....San Francisco, Cal.  
F. C. Baer.....Tolstoy, S. D.

#### ENGINES

Subscriber.....Lewisport, Ky.  
Reader.....Rippey, Iowa  
Carl A. Oehlsen.....Chicago

#### REBUILDING

H. L. Lockwood.....Aberdeen, S. D.  
Leo Glein.....Alhambra, Ariz.  
Arthur Beiser.....Chicago  
E. B. Goldschmidt.....Houston, Tex.

No communication without the writer's name and address will be answered in these columns.

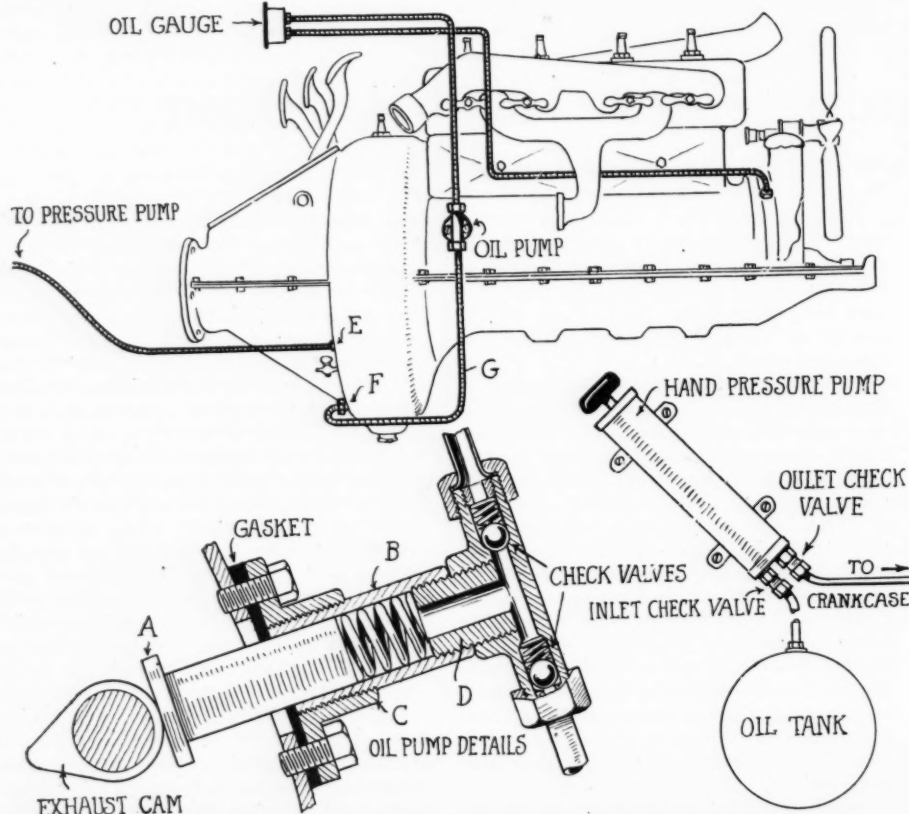


Fig. 1—Suggestions for installing oil pump on Ford engine, operated by exhaust valve cam from No. 4 cylinder

remaining part of the pump is screwed. This part carries the check valves and the manner in which they should be placed is clearly shown in the illustration.

Copper tubing of 1/4-in. diameter is used for the leads and the connections made in the usual manner, using the solderless type of connections. One lead goes from the oil tank to the hand pump and a second pipe from the pump to a hole E in the crankcase. At F the usual Ford petcock should be removed and a fitting screwed in its place so that a lead can be carried to the lower opening of the engine oil pump. This lead is shown at G. The remaining opening at the top of the engine pump is connected to the upper connection on the gage, and finally a pipe is run from the remaining gage connection to the timing gear case top. A hole must be drilled for this and tapped to fit the type of connector used.

### When to Drain Oil

The best time to drain oil from the crankcase on an engine or from the rear axle housing, for that matter, is after a good long trip, while the parts are quite warm, or even hot. When the lubricant is warm it flows more readily. Leave the drain plugs out long enough, so that all the oil that has been splashed over the interior is given a chance to settle at the bottom and run out. If the oil is run out when the engine is cold some of it around the filter and drain will be very sluggish on account of grit and dirt, which settles in every crankcase sooner or later, after the engine has cooled down. Hence, if the draining is put off until the engine is cool, this makes the ejection of oil a slow process. If done while the engine is warm this grit, etc., is carried in suspension in the oil and will run out with it. It is a good plan to leave out the drain plugs of the engine gearset and rear axle all night, whereupon kerosene can be used next morning for further cleansing before refilling with clean lubricant.

## The Electric System

### Connecting Battery to Magneto

**Q.**—Is there any way to connect up the battery on a model 84 Overland so the current can be used in the magneto to give a spark when the starter button is depressed?—H. K. Harris, Chicago.

Where difficulty is experienced in starting Overland cars equipped with Dixie magnetos this can be overcome by installing a connection with the storage battery, so that when the starter switch is depressed a battery spark will occur. But before you do this inspect the magneto to see that it is equipped with the later style breaker box and high-tension winding. The new breaker box can be distinguished by the grass cam cover and the new style winding by the outside grounding bar, both of which are shown in the illustration.

If either or both of these have not been installed, they should be. The wires and connections can be secured complete by



ordering part No. 100386 on Dixie magneto. If a stock of wire is available and suitable connections are at hand, the pieces can be made up, using No. 16 wire, either cotton-wound or rubber insulated, with two layers of water-proof braid and armor wound. One piece 6-in. long is needed, and one piece 24 in. long, the latter armored. If used on the model 75 Overland the piece should be 34 in.

Solder suitable connections on the end, and a  $\frac{1}{4}$ -in. terminal post, as shown in C, Fig. 3, should be fitted in the magneto side plate, locating the hole from that provided for the tie bolt. This is shown at D.

Remove the grounding bar from the high-tension binding coil, new style, and fasten one end of the 6-in. unarmored wire to the coil at the same point, E. The other end of the short wire should be held by the head of the binding post fastened in the opposite side plate. The long armored wire is connected from the post in the side plate to the positive or insulated terminal of the starting motor. Take care not to run it to the other terminal.

The proper connections and principle of operation is shown graphically at F. When the starting switch is depressed current flows not only through the starting motor but also through the primary winding of the magneto coil and then through the breaker points, acting as in a battery system and generating high-tension current in the secondary winding of the coil. As soon as the starting switch is released, the battery current ceases the flow through the coil and the magneto takes up its duties.

#### Changed Magneto Segments

Q—I have a two-cylinder, V-shaped engine, with bore of  $3\frac{3}{4}$  in. and stroke of  $5\frac{1}{2}$  in. For ignition I used a Bosch magneto of the D. A. V. type, 45 deg. I changed the segments in the magneto to 60 deg, which is the angle of the cylinder. But the engine will fire only on one cylinder? What is the trouble? Cannot the segments be moved without affecting the magneto or will a magneto of 60 deg. have to be used?—H. W. Horton, Los Angeles, Cal.

It will not be sufficient to alter the location of the segments only in the 45-deg. engine to take care of the 60-deg. engine. If it were possible to make a 60-deg. magneto along this line the pole shoes and armature would have to be staggered, or cut back, to conform to the 60-deg. requirements of the armature break as well as the interrupter opening.

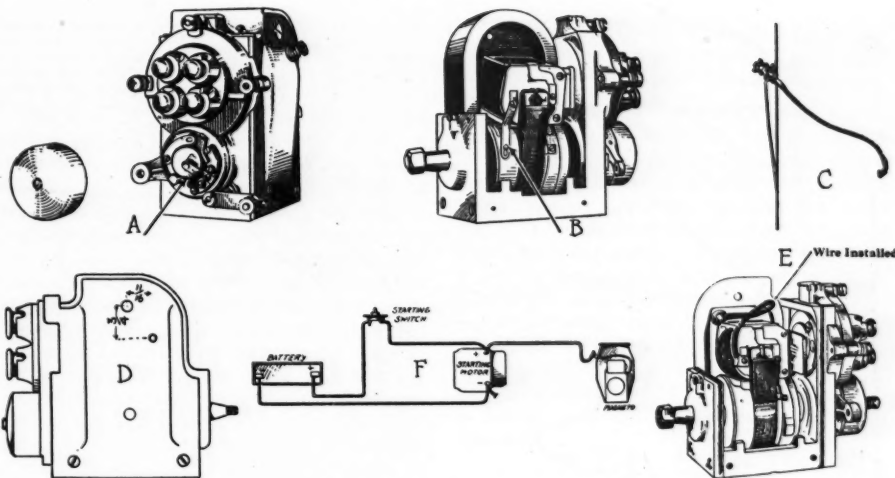


Fig. 3—Manner of connecting battery to Dixie magneto on Overland car. A, new style breaker with brass cam cover; B, grounding bar; C, insulating binding post from side plate; D, location of hole from tie-bolt hole; E, new wire properly installed; F, how current is shunted through magneto coil from battery

The Bosch Magneto Co. has made magnetos arranged for cylinder setting up to 50 deg. Beyond this the D. A. V. construction is not satisfactory, and for engines with angles greater than 50 deg. a regular two-cylinder magneto firing at 180 deg. is used, driven by elliptical gears.

#### Generator Needs Cleaning

Q—When my Studebaker six goes more than 20 m.p.h. with the lights on the battery gage shows a discharge. Below that speed and without using the lights, it works all right. Is the trouble in the switch?—Harry Schroeder, Sheffield, S. D.

The battery indicator should read "charge" whenever you are running more than 10 m.p.h. with the lights off. It should also show a charge when running at 20 m.p.h. with the lights on. If this is not the case, the trouble probably lies in the generator or relay. If the indicator fails to show charge at the proper time, the commutator probably will be found dirty or rough. It should be cleaned with No. 00 sandpaper. Never use emery cloth for this. Place a piece of the sandpaper on the commutator and with the engine running press down on the paper until the commutator takes on a bright appearance. Then wipe off with a dry cloth. To clean the gen-

erator brushes rub with a soft brush the surface which comes in contact with the commutator. The brushes will wear evenly and smoothly as long as the commutator is smooth and clean.

The relay will require no attention unless the battery indicator shows discharge when no current is being used for the lights, horn or ignition. If this should happen, see that the relay points are not stuck together. Adjustment of the relay should only be made by a service station, or one qualified to do this work.

#### Wiring of 1916 Henderson

Q—I have a 1916 electric-equipped Henderson and would like to see diagram for wiring electric system. It has a General Electric generator and Ward-Leonard cut-out. It also is equipped with an ammeter. There are two leads coming from the generator and four connections on the cut-out. There are two wires from the ammeter and one to headlight and one to taillight, so that it is evidently wired single-wire system. It has an Exide storage battery. Give diagram showing where to connect the generator wires and where to connect in the ammeter and battery.—James H. Werckle, Peoria, Ill.

The Henderson wiring diagrams we have show the system to be of the two-wire kind, as in Fig. 2. There are three wires coming from the generator also, with four connections on the cut-out. The manner of connecting in an ammeter also is shown. It is possible that the car you have has been fitted with units taken from other systems, in which case, of course, the wiring would be different, but as we do not know what types of instruments these are it is impossible to give a wiring diagram.

#### Recharging Ford Magneto

Q—Give information in regard to making coils and apparatus for recharging a Ford magneto without removing it from the car.—C. D. Ingersoll, Canton, Ill.

A great many owners of Fords have been desirous of finding some method by which the original properties of the magneto may be revived, so that they may get better light and a hotter spark, also, easier starting on the magneto. While the Ford magneto is as near fool-proof, reliable and simple as one can be made, at the same time it does have the property of losing its original capacity. This, of course, is due to loss of flux, or charge, in the magnets and the contributing factors are time, vibration, cycles of heat and cold and the de-

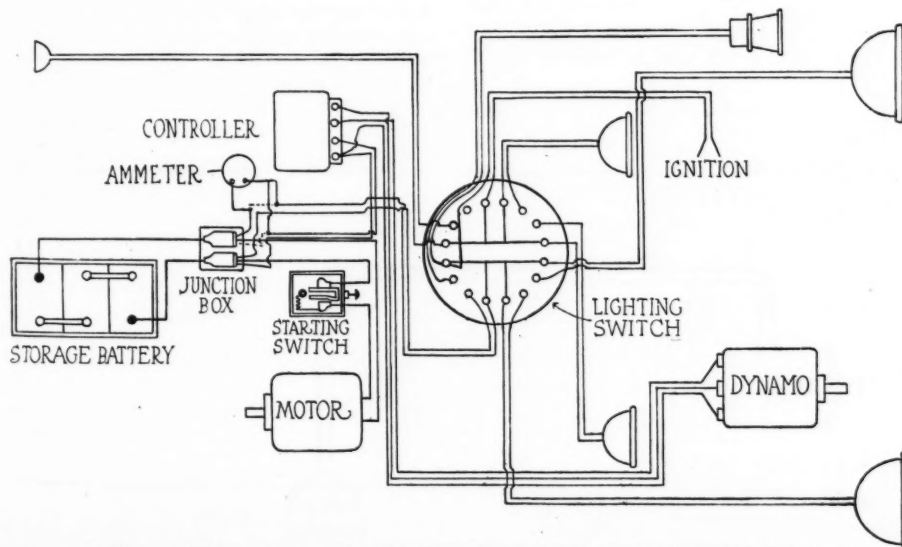


Fig. 2—Wiring diagram of Ward-Leonard system used on the 1916 Henderson

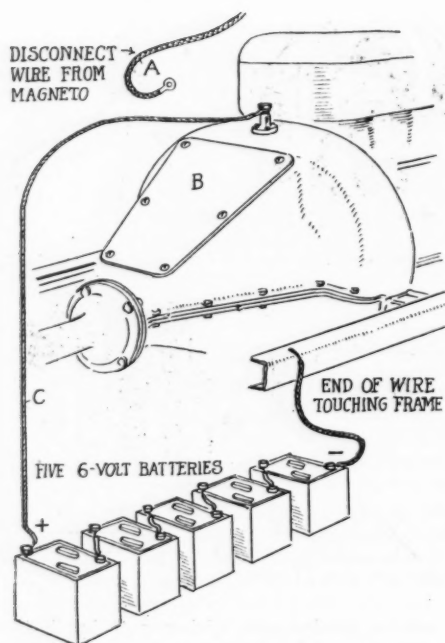


Fig. 4—Four or five storage batteries connected in series are used

magnetizing effect of long continued use of current.

Fortunately, the steel of the magnets never loses its retaining power, all that it loses being its flux, and for this reason, a magnet, as long as its original temper is preserved, needs only to be remagnetized to bring back its original strength of flux.

For several years the only method most repairmen had was to take the engine all apart, dismantle the magnets and charge each magnet separately by a coil, run by batteries or direct-current lighting circuit. Then the magnets had to be carefully re-assembled, taking care not to pound them or get them reversed. This generally required the time of two experienced men for 4 hr., and did not give as good results as could be expected, due to the handling of the magnets.

Recently, methods for recharging the magnets without dismantling the engine have become better understood, so that now the whole process is one of less than a minute and only a small fraction of a cent's worth of current. In this method use is made of the fact that, if the windings are supplied with current of sufficiently high amperage, and the engine is so stopped that the center of a magnet is in front of the center of a coil, when current is applied, the full maximum output will again be obtained, lasting as long as the original charge.

It must be understood that the charge the magnets can retain does not depend on how long the current is left on, as only a few seconds are necessary, but on whether or not the current is above the critical value to cause magnetization.

There are two ways of ascertaining when the magneto is in the proper position for remagnetizing in this manner. Get a small compass and hold it about on a level with the insulated terminal in center of transmission case. Hold the compass about 1 in. to the left of an imaginary line running through this binding post and parallel to the frame of the car, also holding it about

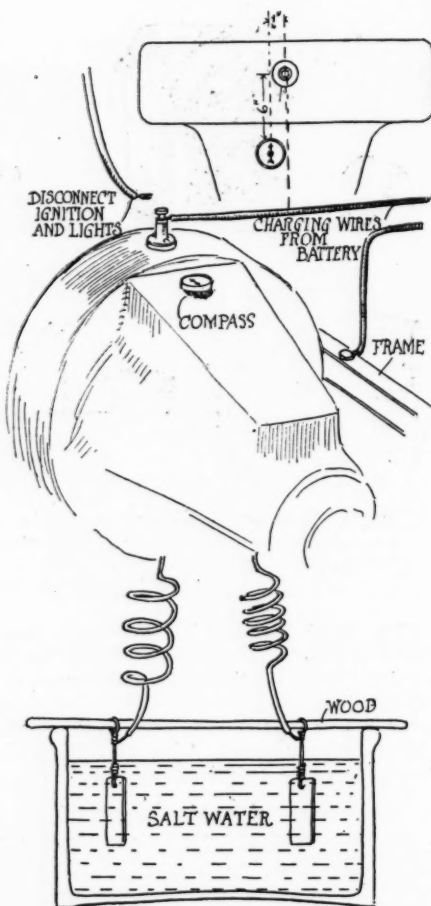


Fig. 5—Above, connections for recharging Ford magneto; below, salt water rectifier

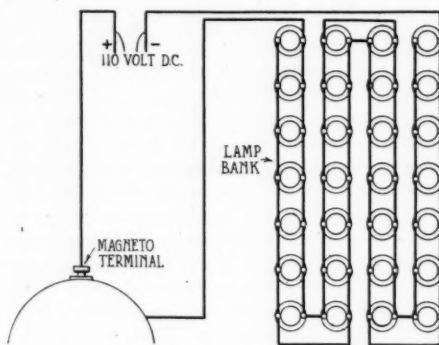


Fig. 6—Dry cells are too weak unless a large number are used in charging the Ford magneto

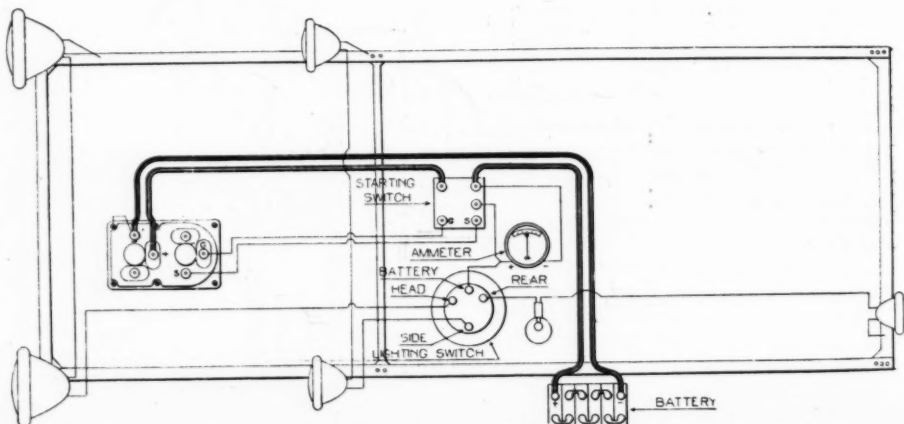


Fig. 7—Wiring diagram of the Fisher starting and lighting system installed on Ford car

5 or 6 in. back from this binding post. The engine then is turned over very slowly until the compass held in this position registers at a point about 1 in. to left of this post.

The other way, if one has no compass, is to take the cover of the transmission case off by removing its six machine screws, and after locating the brass studs in the rim of the flywheel, turning engine over very slowly until one of them is about in line with a point 1 in. to the left of the binding post. It is then ready to apply current.

Just the minimum current necessary is not known, but very fine results have been obtained with 24 volts from storage batteries. This allows 48 amp. to pass with the old-style magneto and 96 amp. with the new one. Dry cells would be too weak for this purpose, although if one had a sufficient number, by connecting twenty-four cells say in series, and connecting two such sets in parallel, requiring forty-eight cells in all, one might expect good results.

But storage batteries are becoming much more common, and only three or four 6-volt batteries are required. All that is necessary is, after connecting the storage cells in series, positive to negative, to connect one end of this battery to the frame of the car and the other to the binding post of the magneto, taking care to break the arc formed on opening the circuit slowly, and also making sure to disconnect the lights and coil from the magneto, as these may be burned out from the high voltage used.

Three to 4 sec. are more than enough to complete the operation, when the normal capacity of the magneto will have returned and the wires may be disconnected.

#### Wiring of Overland 69

Q—Show wiring diagram of USL system on Overland model 69.—Joseph Fairhall, Jr., Danville, Ill.

This is shown in Fig. 8. This system is of the external regulator and internal armature type.

#### Wiring of Reo Roadster

Q—Publish wiring diagram of Gray & Davis starter and generator on 1913 Reo roadster.

2—Is the cut-out built in the generator on a 1913 Reo roadster? Why do they have three wires?—Thomas Murphy, Detroit.

1—A wiring diagram of the Gray & Davis system as used in 1913 is shown in Fig. 9.

2—The cut-out, you will notice, is not built into the generator but is a separate unit usually mounted on the inside or engine side, of the dash. You probably refer to the three wires running from the gen-



erator. The central wire runs from the generator to the cut-out, as does also the wire coming from the positive terminal of generator. The other generator wire goes to the lighting switch.

#### Wiring of 1913 Oakland

Q—Show diagram for wiring 1913 Oakland car, Delco system.—J. W. Goddard, San Francisco, Cal.

This diagram is shown in Fig. 10.

#### Wiring of Fisher System

Q—Give specifications of the Fisher system for Ford cars. What is the address of the manufacturer of the Fisher system?—F. C. Baer, Tolstoy, S. D.

We presume you want a wiring diagram, which is shown in Fig. 7. This system is made by the Fisher Electric Works, Detroit.

## Engines

### Knocks Hard to Locate

Q—I have been troubled since early spring with knocks, sometimes two or three at once. I have taken the engine, which is a Ford, out and adjusted the main bearings twice and have tightened connecting rods quite a number of times. Sometimes these adjustments seem to stop the knocks for a few miles, when one or more will develop again. As a last resort, I have put in new pistons, new rings with non-leaking rings at top, new connecting rods scraped to fit and have put in new center cam-shaft bearing and have seen that the other two are tight. The valve-stem clearance is about right. I have run this car about 5000 miles. The carbon has never been thicker than the blade of a penknife. The knock which has been most persistent is heard at every turn of the engine at a speed of 12 to 18 m.p.h. and is louder when the throttle is being opened slowly. It is not heard when going uphill any more than usual and is not heard when going uphill in two. Ignition and carburetion are fine. I have plenty of power without any missing.

Water in radiator gets hot after a mile or so of running with spark advanced and carburetor set lean. It seems to me my trouble is traceable to a lack of oil in front of engine, but whenever I take head off engine the cylinders have plenty of oil and when I take bottom of engine cover off the little basins are always full of oil. While I had timing gear off, I turned engine over by hand as fast as I could and oil ran out of the oil tube in a stream about the size of a No. 12 wire.

What is your opinion of this knock? Is the

oil tube carrying oil enough? Do these tubes ever get clogged so as to stop the oil flow?

2—Can the oil tube be opened up without taking the engine out of the car?—Subscriber, Lewisport, Ky.

Knocking in an engine is one of the hardest things to find because most of the noises, while they indicate that something is not right, are so nearly alike in character that it is most difficult to distinguish the cause of one from another.

It is only possible to diagnose motor knocks in a sort of general way, for even though to the experienced ear a certain knocking may appear to be caused by too advanced a spark, for instance, it may in reality be caused by a loose rod bearing or a shaft bearing. But the more experience a man gets with the particular motor he is driving, the easier it is for him to tell just what any kind of a knock in that engine results from.

Some of the knocks, of course, are easier to distinguish than others. For instance, it is usually possible to tell a loose piston knock from the others. This is commonly called a piston slap.

Generally speaking, there are about five causes of engine knocking. These are: Spark too far advanced, pistons and cyl-

inders badly carbonized, loose connecting-rod bearing, piston too loose, cylinder worn or a ring broken; loose main bearing.

The first of these, namely, spark knock, is perhaps about the most common knock and the one with which the average driver is most familiar. It usually may be distinguished by a rather dull metallic sound which is in contrast to the sharp sound of metal striking metal. Supposing a coin or a key is wrapped in a thickness of newspaper and then gently tapped against the enameled metal part of a desk telephone. This will be a close imitation of an ignition knock but the best way to know the sound of this noise is to make the car pull a heavy load with the spark fully advanced.

The spark knock is due to the spark being so far advanced in relation to the speed of the engine that the charge is ignited before compression is completed, the firing of the charge exerting a sudden downward force upon the piston before it should receive that downward impulse. The remedy is very simple. Pull the spark lever down lower on the quadrant until the knocking stops, or remove the load

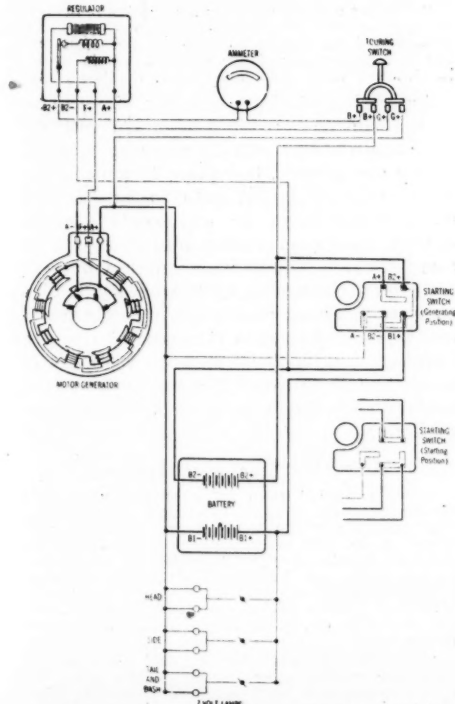


Fig. 8—Wiring diagram of USL starting and lighting system on Overland 69

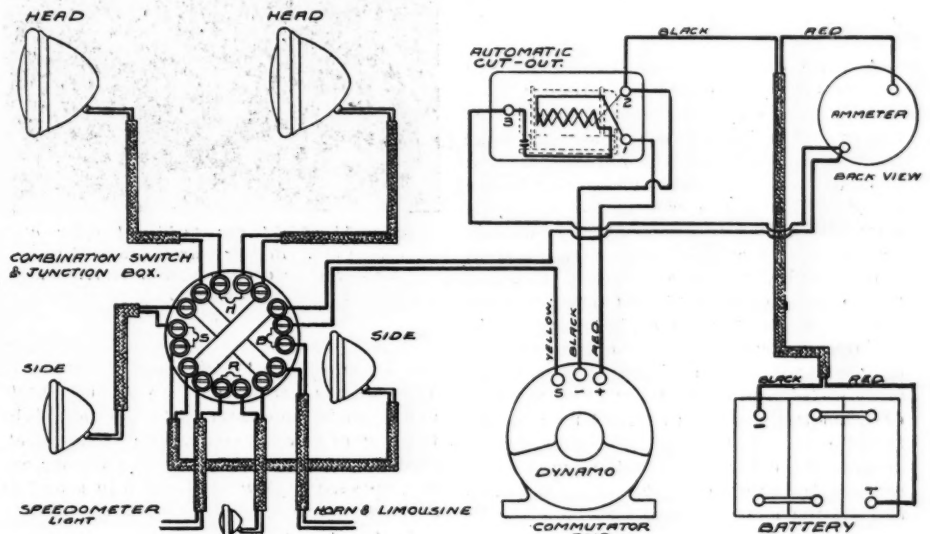


Fig. 9—Wiring diagram of the Gray & Davis system for 1913 Reo

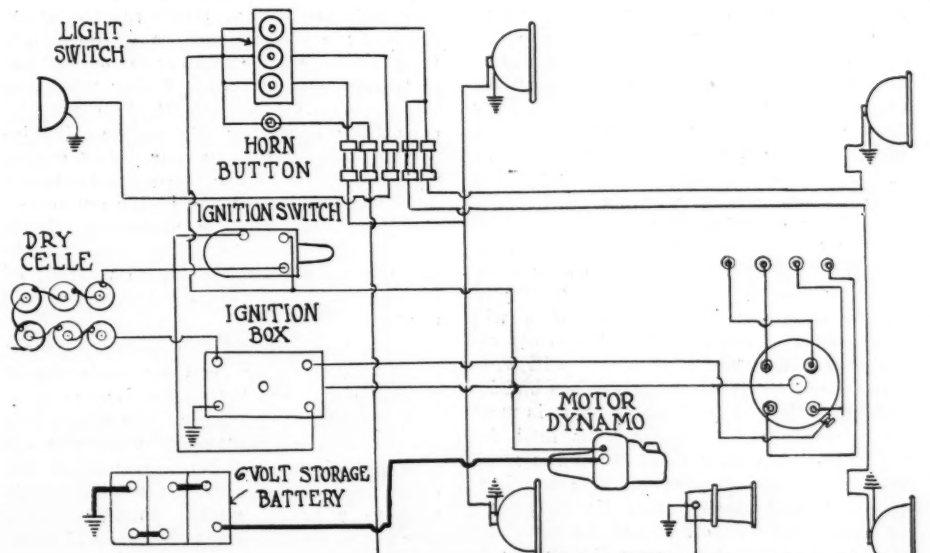


Fig. 10—Wiring diagram of Delco system used on the 1913 Oakland

from the engine by throwing out the clutch, or slow down the engine.

The general indication of a carbon knock is a fairly clear and hollow pounding which is specially evident when the engine is hot and when on a hard pull, such as through deep sand or up a good grade. Carbon knocking is due to excessive carbon deposits on cylinder walls, piston heads, etc. The carbon particles become red hot, due to the intense heat within the combustion chamber, and they ignite the charge before compression is completed and the piston is in position for ignition to take place. In other words, it is a pre-ignition knock. Improperly adjusted carbureters which send too rich mixtures to the cylinders, poor lubricating oil and excessive use of oil are the three main factors in the formation of carbon incrustations.

#### Similar to Ignition Knock

For obvious reasons, a carbon knock is not dissimilar to an ignition knock, although it is somewhat more muffled. Suppose the same comparison to be made in the imitating of a carbon knock as already made for the spark knock only, instead of wrapping the coin in one thickness of the newspaper, a half-dozen thicknesses are used between it and the telephone body to imitate the sound.

A loose connecting-rod bearing on the crankshaft gives out a noise every time the piston to which it is connected receives the explosive impulse. Supposing a light tapping is done with a hammer against a piece of steel. There is a clear ring to the sound, which in the case of the engine is somewhat dampened because it is within. If the tapping of the hammer on the steel is done at a distance, the closest imitation to the rod knock is brought out.

This particular type of knocking is especially evident when the engine is running without load, or idling. It becomes quite distinct when coasting down a grade or when the engine is speeded up and the throttle suddenly closed. This is chiefly because the other noises of the car are less accentuated at such times, making it easier to hear the clear metallic knock.

There is only one remedy to the rod knock, and that is to remove whatever part of the crankcase gives access to the bearings and to properly adjust them. If shims are placed between the cap and rod end, such thicknesses of these should be removed as necessary to make up for the wear that caused the looseness. The degree to which the bearings have been tightened can usually be determined by turning the crankshaft. Tapping the cap with a hammer is sometimes a good indication to an experienced man of the tightness of the bearing. It should be remembered that there is a happy medium between a bearing that is excessively tight and a loose one. The babbitt soon will burn out in a bearing that is too firmly set up, or if it does not burn out, it will wear away rapidly. After an engine has had its bearings taken up and adjusted, it is most advisable to run it under light load for several hours before using it on the road. This will serve to wear in the bearings properly, and during this limbering up process, plenty of oil should be used and many use sufficient to cause the engine to smoke.

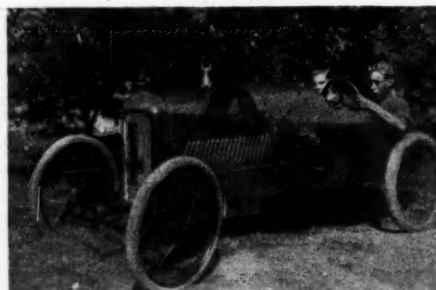
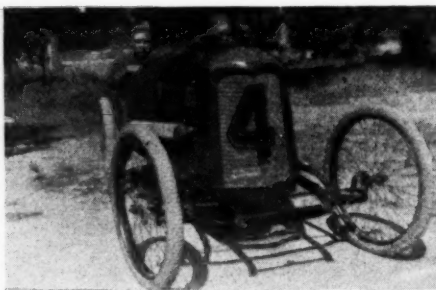


Fig. 11—Light car fashioned after a racing car. Bicycle wheels are used and the engine is a twin-cylinder motorcycle powerplant

When the throttle is opened suddenly, the loose piston knock usually is heard. This sounds something like a dull rattle and it might be compared to the very light tapping of a coin against an iron object. Sometimes, especially when the pistons are dry because of low oil level, the sound is a sharp metallic one.

Such a knock is due either to a broken ring which strikes loosely against the cylinder wall and the piston groove, or to the looseness of the fit between the cylinder and the piston itself. A piston slap is therefore usually no fault of the driver, but is traceable to improper fitting when the engine was assembled. It also may be caused by operating the engine with insufficient oil for long periods. Most engine makers throw out those pistons which would have too much clearance in the cylinder—they are very slightly undersize. It is possible for a piston slap, however, to come in an old engine due to wearing of cylinder wall and piston barrel after long use.

There is really no way of remedying a noisy piston other than by replacing it with one that has the proper clearance.

A loose main bearing of the crankshaft usually makes itself heard when the engine is doing heavy pulling such as hill climbing or sand going. It is distinguishable as a heavy muffled pounding much like the noise that would be made if someone took a hammer and struck the ground a few feet away. It can sometimes be heard

when the engine is running at low speed and pulling a load, but of course, the harder working naturally accentuates the sound.

The cause is either a worn bearing or looseness of the cap holding the shaft in place, as with the connecting-rod trouble cited here. The remedy is the same, for it means removal of the lower part of the crankcase and proper adjustment of the shims—if there are any—and possible working down of the babbitt with a file.

Often a noisy tappet is mistaken for an engine knock. When there is too much clearance between tappet and valve rod, a metallic click is bound to result. Usually the clearance should not exceed two thicknesses of thin paper.

The oil tube supplying oil from the flywheel housing to the timing gears is large enough for all speeds this engine is likely to encounter in the stock job. It happens sometimes that these tubes get clogged, for instance, a piece of felt washer may get into the funnel at flywheel end and get into the tube, thus cutting off much of the oil. You can tell if the front cylinders have not been getting oil by taking off the head and examining the cylinder walls. They should be covered with an oil film. If there is any signs of scoring, and the front cylinder looks quite dry, you may suspect the oil tube being clogged.

2—You do not have to take the engine out to get at this tube. Simply take off the cover of the transmission and also the front end plate of engine. You will see the funnel into which the flywheel throws the oil fastened to the magneto spool carrier on the right side of the engine. At the front end you will note the open end of the pipe. Run a soft iron wire through the pipe and see if it comes out the other end. It may bring some foreign matter with it. At any rate you can clean it out and make sure it is functioning.

#### High and Low Compression

Q—What are the advantages or disadvantages of raising the compression of an engine? I understand an engine of high compression will not last as long as if the compression is lower. Is this correct?—Charles Corby, Oakland, Cal.

An engine of given cylinder dimensions, if the compression is increased, will deliver more power and be more economical in the use of fuel, but there is a limit beyond which it is not safe to go. If too much compression be employed there is danger from overheating and the heat of compression is apt to cause pre-ignition and consequent knocking in the bearings. The compression used with present engines averages about 65 lb. to the square inch. In burning heavier fuels such as kerosene it is customary to lower the compression, for example, by fitting a thick cylinder head gasket.

#### Adjusting Chalmers Bearing

Q—How can I take off a transmission and clutch case on a 1914 Chalmers 4-36 engine. The crankshaft has about  $\frac{1}{4}$  in. end play and about  $\frac{1}{8}$  in. side play. The adjustment is on the rear bearing back of the flywheel and seems to be taken up by pieces of brass shimming, which I think must be adjusted with the flywheel off. After taking out the case bolts, will the case slip off, or must the clutch springs be taken out?

2—With the clutch thrown out I can hardly turn the engine over by hand, but with the clutch engaged it turns over very easily. When the engine is running idle, the clutch will not release to shift into the different speeds. It acts in the same way with and without the oil



and kerosene in the clutch-case. How can this be stopped?—Carl A. Oehlsen, Chicago.

1—Take off the lower half of crankcase, block up the flywheel or support it on a jack. Remove the bolts from the bearing cap and then take off one or more of the liners until proper adjustment is obtained.

2—We believe much of your difficulty is caused by the end play in the crankshaft, which carries the clutch shaft with it, and when you attempt to throw out the clutch, you carry the whole mechanism too far forward, so the clutch is not sufficiently released. By taking out the end play, this should be overcome. Also be sure the clutch is adjusted properly. As long as the engine reservoir contains sufficient oil, there is nothing to worry about in regard to lubrication of the clutch. Should the clutch slip under load, it may be overcome by tightening the clutch springs. These are adjusted through the hand hole on the slanting portion of the clutch case. Always tighten the springs equally.

## Rebuilding

### Wants Hupp 20 Speedster

Q—Would like suggestion for building a Hupp 20 into a smart looking speedster?—E. B. Goldschmidt, Houston, Tex.

Illustrations showing a speedster body adapted to the Hupp 20 chassis are shown in Fig. 15.

### Car with Motorcycle Engine

Q—I have a twin-cylinder 12-hp. motorcycle engine and would like to put it in a small car with a single seat, the wheels to be about 22 or 24 in. Publish side view of such a car, showing also a tire on the back.—H. L. Lockwood, Aberdeen, S. D.

A suggested design for this car is shown in Fig. 14. Such a car is called a mono-car, because it affords room for only one person. We have not shown the drive mechanism, which could be by chain to one of the rear wheels or by shaft to a bevel-driven rear axle. Such an axle would have to be made up special and would run into a lot of money.

### Wants Two Car Designs

Q—I would like to have you draw a side view of two cars, one showing a town car body to be mounted on an average large car chassis and the other a two-passenger body with plenty of carrying space in the rear. The town car should have a small runningboard or step and carry a spare wheel on the side. I do not care for anything unusual in looks, just good plain design.—Arthur Reiser, Chicago.

In Fig. 12 is shown a suggestion for a town car patterned after your requirements. Although there are some features in this design not found in most cars of this type, you will note there is nothing

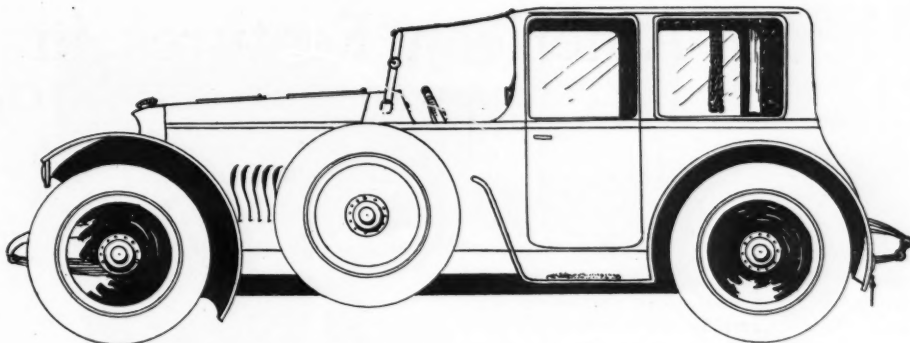


Fig. 12—Suggestion for town car body to be mounted on average chassis

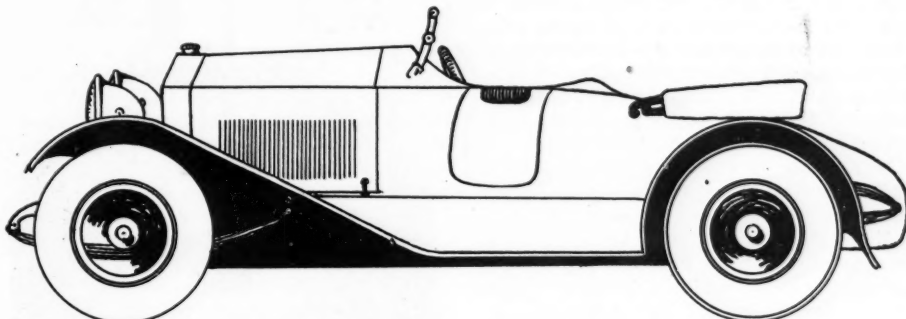


Fig. 13—Two-passenger speedster body designed with large carrying space in the rear

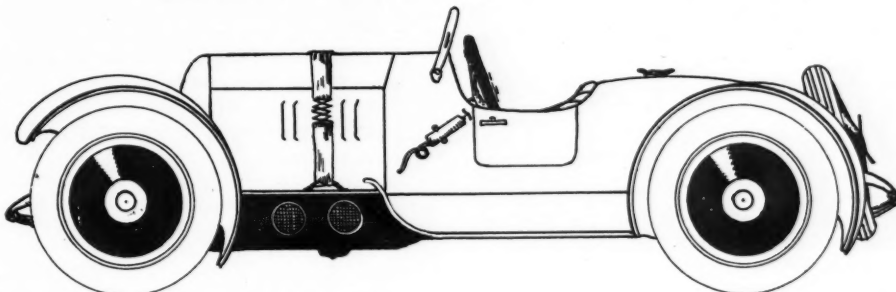


Fig. 14—Side elevation of small speedster using double-cylinder air-cooled motorcycle engine

very radical or freakish. The same is true of the two-passenger roadster, shown in Fig. 13. It follows conventional lines and has an abundance of luggage space in the after deck.

### Reader Builds Cyclecar

Alhambra, Ariz., Editor Motor Age—The inclosed illustrations are of a cyclecar constructed by Lewis Scherer and the writer. The engine is a big-valve twin Merkel. The wheels are motorcycle type, 28 by 2½ front rear. The frame is T-section iron, with kickup front and rear. The springs are cantilever and extremely easy riding. Irre-

versible steering gear with Ford knuckles and parts turned down on lathe are used, while the steering wheel has shock absorbing spokes. Large flexible exhaust tubing, numbers painted on body and long tail with gas filler cap and body finish of golden orange give a catchy racer appearance. Real leather upholstery and mahogany instrument panel give it a sport effect. The wheelbase is 83 in., tread 43 in. and weight about 450 lb., making the cycle part of the word cyclecar rather diminutive. We have obtained more speed than we can safely ride in it with two up on a well-banked mile oval course.—Leo Glein.

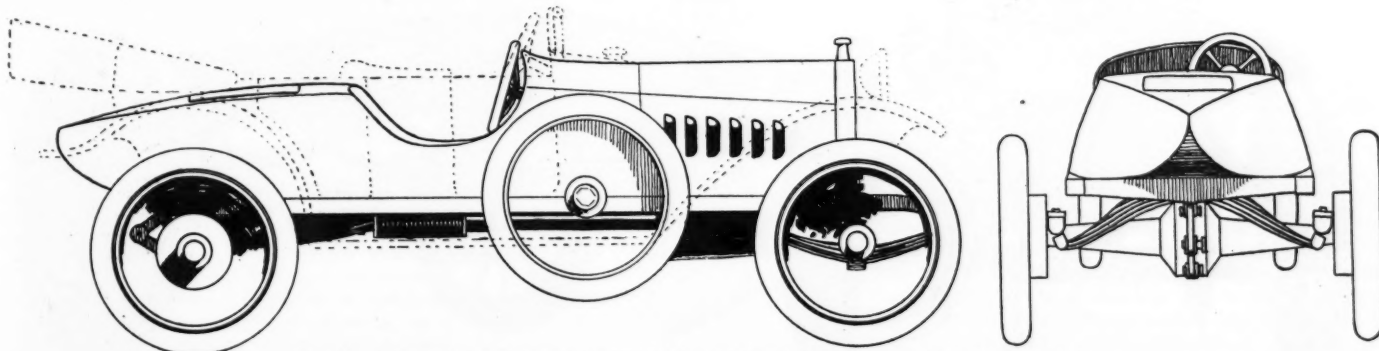


Fig. 15—Side and end views of Hupmobile 20 converted into a smart-looking speedster

# All-American Features in New Truck

## Standard Units for 1-Ton Chassis

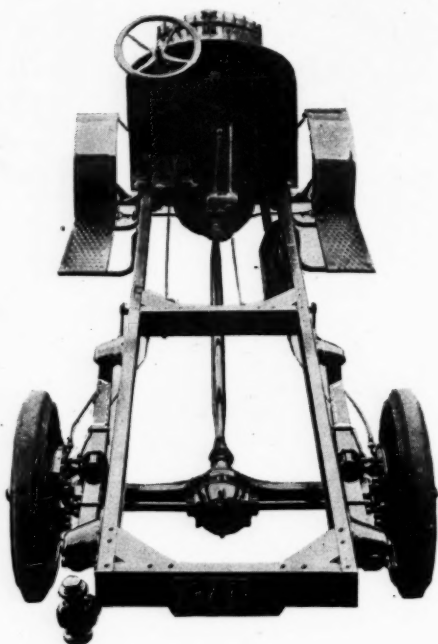
THE idea of confining the manufacture and distribution of motor trucks to wholly American hands has its patriotic appeal these days. Such is the plan of the All-American Truck Co., Chicago, and the name of the concern as well as the name of the truck, the All-American, carries out the idea. This concern is just starting production of a 1-ton truck of standard design in the large plant which was built for the Ogren Motor Car Co. The organization is under the management of R. H. Spear, president, one of the organizers of the Scripps-Booth Co. and more lately from Gramm-Bernstein Co. The truck is the design of Robert J. Sutton, formerly production manager with the Four-Wheel Drive Co.

In addition to the All-American idea in which, as stated by the company, every operation, every piece of material, from radiator to taillight, will be a practical demonstration of the patriotic principle in which only parts made in America will be used in the trucks and only American citizens employed in the factory and dealers' organization, another wartime merchandising feature is found. The feature is the policy that for the period of the war All-American trucks will be sold only for service in the essential industries as defined by the War Industries Board.

Production is commencing on the first lot of the 1500, which is scheduled as the first year's production, and inasmuch as the concern is now working on a war order it is to be assumed that sufficient for both the military and commercial production will be forthcoming.

### 1-Ton Chassis Now

The 1-ton chassis, known as the model A, upon which factory efforts will be concentrated for the time being, is made up of standard units which include Herschell-Spillman four-cylinder  $3\frac{1}{4}$  by 5 in. engine, Dixie magneto, Borg & Beck clutch, Grant-Lees three-speed gearset, Ross steering gear and Torbensen internal gear drive



The All-American chassis is clean and accessible

rear axle. The chassis weighs 2800 lb. and sells for \$1,295.

The standard bodies fitted are a stake and express and a special body for the farm called the Farmer 8-1. The details of the latter type are not available as yet.

Made up as it is from standard parts, there nevertheless is opportunity for considerable originality in methods of assembly, and in the smaller parts which link the major assemblies together. Inasmuch as these smaller parts are of special All-American design and all machine work on them is to be done in the All-American factory with its own jigs and tools, these details of construction distinguish the chassis from

any other which might have been made up from products of the same parts manufacturers.

One of the features, therefore, it has been possible to incorporate in the truck has been that of interchangeability in the minor fixtures. This is illustrated in the case of the spring hangers in which both the forward and rear supports of the rear springs are interchangeable as also are the rights and lefts. This, increasing the speed and manufacture of assembly also incidentally makes maintenance and replacement simpler, should such become necessary.

The absence of grease cups is a noticeable feature, oilless bushings being used in the spring eyes and at other points. One unique particular of the chassis design is the utilization of the space above the engine and under the hood for the fuel tank, thus giving a direct gravity feed to the carburetor and conserving space behind the dash.

It is claimed that either kerosene or gasoline may be used as fuel, this owing to constructional features of the Herschell-Spillman engine in which the incoming gases are carried over portions in contact with the exhaust gases and thus brought to a high temperature before their induction into the cylinders. It is understood that further heating arrangements in connection with the carburetor may be fitted to facilitate further the use of kerosene.

Tires are 33 by 4 pneumatics in front and 32 by 4 solid in rear. The wheelbase is 130 in.

### Condensed Specifications

Engine—Herschell-Spillman four-cylinder  $3\frac{1}{4}$  by 5, cylinders block cast.

Fuel—Gasoline or kerosene.

Lubrication—Combination force feed and splash.

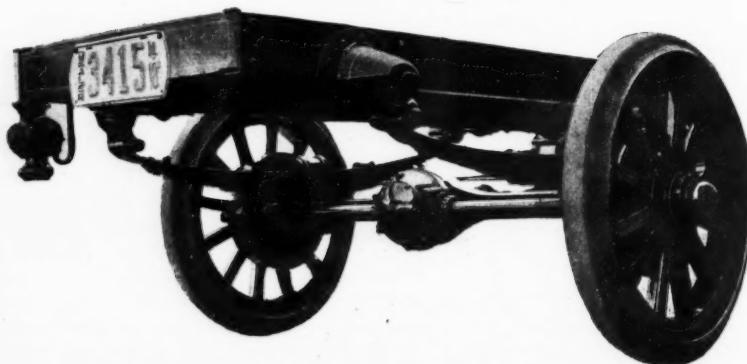
Cooling—Thermo-syphon.

Ignition—Dixie magneto.

Carburetor—1 in. special truck design.



Below—Rear of All-American chassis, showing accessibility of Torbensen axle and one of the interchangeable spring attachments. Left—Front of All-American chassis, showing sturdy radiator with its guards





Fuel Feed—Gravity from 12-gal. tank under hood.

Clutch—Borg & Beck dry-disk.

Gearset—Grant-Lees three-speed.

Drive—Hotchkiss type, tubular shaft and universals.

Rear Axle—Torbenzen internal gear.

Gear reduction 6.521.

Brakes—External and internal on rear wheels.

Steering Gear—Ross, 18-in. wheel.

Springs—Front, semi-elliptic, 2 in. by 38

in. Rear, semi-elliptic, 2½ in. by 54 in.

Wheels—Wood regular, steel extra.

Tires—Front, 33 by 4 pneumatic; rear, 32 by 4 solid.

Loading Space—115 in.

Wheelbase—130 in.

Equipment—Front fenders and running-board, head and taillights, horn and tools.

Chassis Weight—2800 lb.

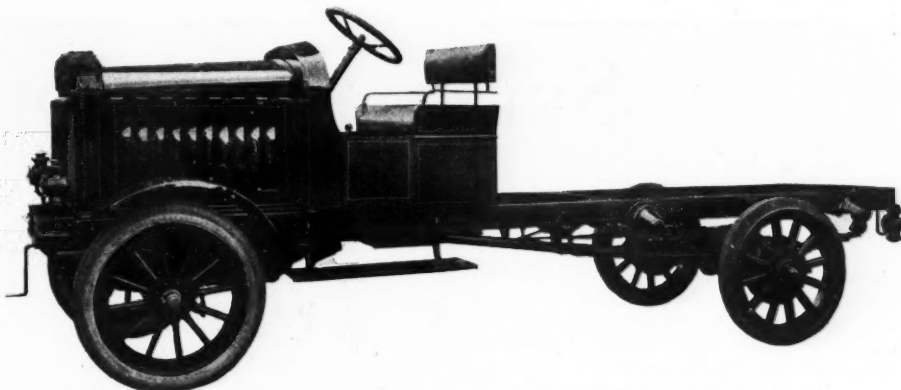
Price, Chassis Only—\$1,295.

## A Catalytic Plug

SOME interesting development work in spark plug insulators consisting of using a catalytic material to produce flameless catalytic combustion of part of the explosive mixture to keep the plug, especially the porcelain, free from carbon has been carried out by C. K. Harding of the Rare Earth Chemical Laboratory, Chicago. The catalytic body in this case preferably is composed principally of the oxides of the radio-active elements thorium and uranium. In a spark plug it is only necessary to have the flameless combustion start a little in advance and at a few hundred degrees lower temperature than the inflamm- ing temperature of the mixture.

Ordinarily the plug resembles those of conventional types, as shown in the illustration. An annular chamber 10 is formed in the lower end of the insulator, the diameter of which is considerably larger than the diameter of the electrode. Into this chamber is introduced a hollow cylinder 11, having catalytic properties. There is a space between the cylinder and the internal wall of the porcelain or insulator. The cylinder is held in place by suitable means. Nut 13 preferably is made with an external diameter smaller than the external diameter of the catalytic cylinder and is partially countersunk in the end of it.

When the engine takes up its regular cycle of operations and has been operating long enough for the cylinders to become well heated, the lower end of the porcelain 3 becomes heated, as will also the catalytic cylinder 11. During the compression stroke the explosive mixture will be forced up into the chamber 10 surrounding 11. As these parts are hot, at a temperature considerably below the temperature at which the flame will be kindled in the gas, catalytic combustion of part of the mixture will take place in and adjacent to this body. This combustion is a rapid oxidization action, but it occurs without raising the temperature of the mixture where it will be ignited, as it is characteristic of combustion produced by contact processes with solid catalytic agents in combustible mixtures to be localized and not to propagate through the whole mixture. Thus by a catalytic combustion of part of the mixture, at a time before the whole mixture is exploded by the usual spark there is sufficient free



All-American chassis—the fuel tank is under the hood

oxygen in the mixture to oxidize and burn off carbon.

It is said there will be less oxidizing remaining to be done to that small portion of the explosive fuel-air mixture in chamber 10 in contact with the insulator and catalytic body when the explosion occurs. Thus, by this double combustion there will be more complete oxidization, promoting a clean burning of that part of the charge likely to deposit carbon on the porcelain. This is important, especially where present-day commercial gasoline is used. Such gasoline contains usually a certain amount of oil having a relatively high boiling point, and in this the carbon occurs in such form that it cannot be completely oxidized in the short period of time afforded by the explosion in the cylinder to entirely prevent the formation or deposit of some carbon.

Also, the parts of the insulator are kept too hot for the deposition of carbon, or if carbon would be deposited it immediately would be burned off, thereby preventing the formation of carbon on the external surfaces of the lower end of the porcelain, where, if much carbon is deposited, there would be tendency for electric leakage across from the porcelain to the shell 2.

Due to the tendency for multiplicity of cylinders, especially in aviation engines, freedom from spark plug fouling or short-circuiting becomes very essential. These conditions have been instrumental in this Chicago institution turning its attention toward developing a plug from which the carbon could be burned off electrically by causing part of the mixture to pass in con-

tact with a non-oxidizing catalytic agent placed in heat-transmitting proximity to the porcelain insulator.

## CANADIAN FORD DIVIDENDS

Windsor, Ontario, Sept. 6—The Ford Motor Co. of Canada has only paid 5 per cent in dividends to shareholders in the last few years and announces that further dividends will not be paid for some time to come. This is due principally to the fact that all the reserves were used in purchasing materials with which to keep the plant in operation, not merely for the next season but for several years.

During 1918 selling prices have been increased 20 per cent, while the cost of production has increased 24 per cent, compared with a 7 per cent decrease in selling prices and a 14¼ per cent increase in cost for 1917.

## REED FOUNDRY ON WAR BASIS

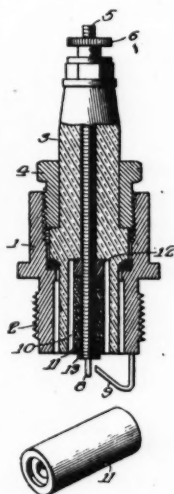
Kalamazoo, Mich., Sept. 6—The Reed Foundry & Machine Co., which manufactures the One-Man tractor, is engaged in making steel castings for different branches of the War Department—for tanks, ships, hydraulic parts used for piercing shells, iron working lathes to be used in machining and finishing shells. Castings for ditching and dredging machinery are made, and these are sent abroad for trench work. Castings are also made for winches and cranes used in powder plants. More than 75 per cent of the Reed company's foundry work is for Government account.

## FARM LIGHTING SYSTEMS

Columbus, Ohio, Sept. 7—The College of Agriculture has opened a course on farm lighting systems, which will be of value to anyone wishing to specialize in this field. There are three lessons, the first referring simply to acetylene, while the others go into electric and other fields. The chief features of each are explained and estimates given also of installation and maintenance. J. E. McClintock is supervisor of the course.

## FIRESTONE INSURES EMPLOYEES

Akron, Ohio, Sept. 6—More than 12,000 employees of the Firestone Tire & Rubber Co. will be insured by the company. This applies to workers who have been in the employ of Firestone for thirty days and is cumulative, increasing for each year of service up to the fifth year, after which the maximum benefit is \$1,000.

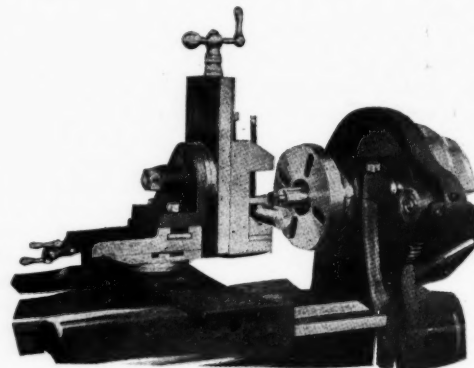
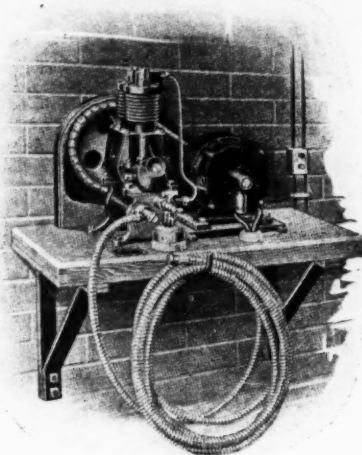


Cross-section of catalytic plug

# Service Equipment

## Milling Attachment

THE milling attachment made by the Barnes Drill Co., Rockford, Ill., is a handy vise for a wide variety of milling jobs, including the cutting of key seats for Woodruff keys, splining shafts, square shafts, splitting bushings and for drilling and boring small parts. The vise swivels and is graduated 180 deg. in the vertical plane. The collar on the vertical screw is graduated in 0.001 in. The equipment consists of the milling attachment complete, with steel V block, steel plate, gib and bolts for attaching and ball crank handle. The specifications are: Vertical feed, 6 in.; cross feed, 12 in.; vise will hold, 4½ in.; depth of jaws, 1¾ in.; width of jaws, 5 in.; weight boxed, 75 lb.



Mayo stationary garage pump, left, and Barnes milling attachment

## Stationary Garage Pump

The Mayo stationary garage pump is fitted with a two-cylinder pump and a ¼-hp. motor. The pump is chain-driven, and a neutral air chamber between the pump and the tire outlet prevents burning out of the motor. The whole outfit is mounted on a heavy wall bracket, and 25 ft. of armored hose are supplied. Price, with 110- or 220-volt AC or DC motor, \$95; other motors, specially priced. The same concern also supplies a free air outfit, model 8-C, which maintains air in the reservoir at a pressure of 125-150 lb. at all times. An automatic electric switch starts the motor driving the pump when the pressure drops below 125 lb. and cuts off the current when it reaches 150 lb. Adjustments can be made to vary these pressures after the outfit is installed. The tank is 16 by 48 in. and can be pumped from empty to 125 lb. in 11 min. and 125 lb. to 150 lb. in 3 min. When the current is cut off the air is exhausted from the tube so the compressor starts idle. The outfit includes tank, air compressor, automatic switch, needle valve and all fittings between compressor and tank. Price, \$1.30.

Leather belt, 2-hp. motor and electric wiring are extra. The pump is made by the Mayo-Skinner Mfg. Co., Chicago.

## All-Purpose Lathe

The Hamilton is a 14-in. rapid production lathe for all-purpose work. It is designed to meet the requirements of modern high-speed tool steel. Among its features are an improved gearbox, semi-steel bed with wide V, box-type head stock, chrome-nickel steel spindle, double apron and drop-forged apron gears. Friction is reduced to a minimum by a central oiling system for the gearbox and apron, sight-feed spindle oiler and the fact that every running part bears in bronze bushings. Regular equipment consists of compound rest, double-friction countershaft, large and small face plates, steady rest, centers and wrenches. Extra equipment, such as double back gears, taper attachment, relieving attachment, cabinet legs, turrets, oil pan, chucks, etc., are furnished at additional cost. The bed is

semi-steel of extra width and depth, the side walls being strongly reinforced and secured by cross braces at frequent intervals. The bed has one V and one flat track in front, two V's in back. The outer V is of extra width and extends well out in front, so as to give ample support to the tool carriage when working on large diameters. The head stock is of box construction, the sides extending well up to the center line of the spindle, tying the front and rear bearings and causing the spindle thrust to be taken by both, as well as eliminating thrust and vibration. It is provided with single back gears and four-step cone for 3-in. belt. An improved locking device permits the cone and face gear to be instantly connected or disconnected without a wrench. The spindle is hollow, of chrome-nickel steel accurately ground. The spindle boxes are of phosphor bronze, carefully scraped to a bearing and provided with sight-feed oil cups. The end thrust is taken on a special ball bearing



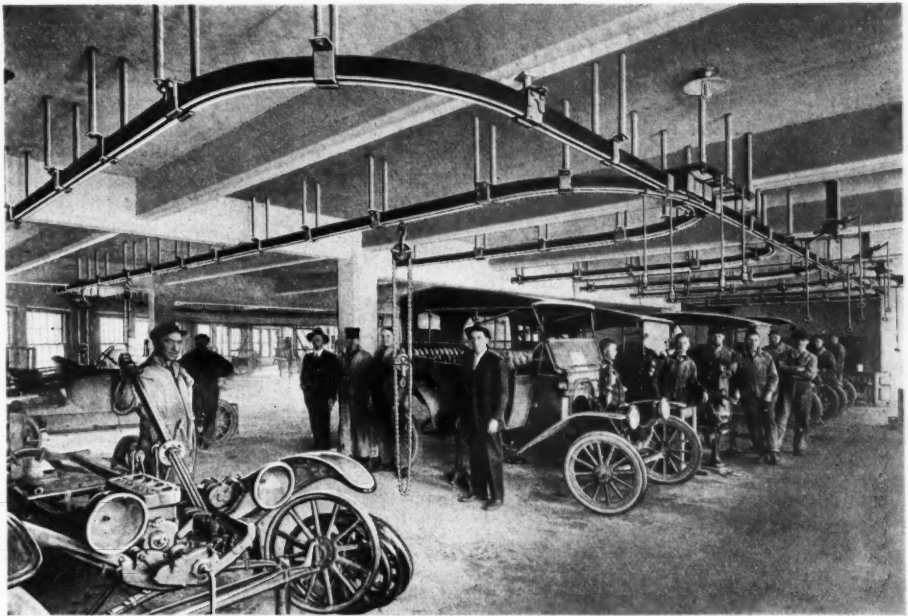
Here are two lathes for the repairshop. The one at the left is made by the Barnes Drill Co., while the one at the right is a product of the Hamilton Machine Tool Co.



supported against the inside of the rear spindle box, with take-up nut on the outer end of the spindle. Forty-eight different threads and feeds are available. Every provision is made for the convenience of the operator. Quick-action handles are provided on tail stock screw, apron hand wheel and cross feed screw. Central oiling devices are provided on the apron and quick-change-gear box. All other oil holes are protected by suitable covers. All gears are inclosed. Some of the principal dimensions are: swing over shears, 16 in.; swing over compound rest, 9½ in.; length between centers, 3 ft.; hole through spindle, 1⅝ in.; length of bed, 6 ft.; size of tools, ⅝ by 1 in.; weight skidded, 2600 lb.

#### Barnes Lathe

The lathe put out by the Barnes Drill Co., Rockford, Ill., is especially adapted for garage and general repair work and is furnished complete with countershaft, compound rest, center rest, one 20-in. diameter face plate, one dog plate, full set of change gears for thread cutting, also two centers finished and ground, as well as necessary wrenches. It is provided with six quick-change geared feeds and the spindle is large, 2½ diameter in front bearing and with a 1⅞-in. hole through same. All the gears are covered with suitable guards. The sliding top bed is a feature. This permits the operator to swing pieces of larger diameter through the gap and of more length between centers than is possible on the ordinary 14-in. lathe. The head stock is heavy and strong. The spindle is large and is made from the best grade of machinery steel and runs in split bronze bearings. The



Over-Way garage system for lifting cars and trucks on end, etc.

cone pulley has four steps of large diameter and is strongly back geared, giving eight changes of speed. A push pin on the head gear allows the cone to be instantly locked or unlocked without a wrench. The feeds are as follows: 0.007, 0.011, 0.017, 0.019, 0.030 and 0.045 in. The lathe cuts either right or left threads consecutively from 2 to 18, including 11½ pipe thread, by twos from 18 to 36 and by fours from 36 to 48. The taper attachment, which is furnished at extra cost, is fastened to the

back of the carriage and travels with it. This turns any taper up to 2¼ in. a foot. The swivel guide bar is graduated in inches and is adjusted by a hand screw. Some of the principal specifications are: Length of bed regularly finished, 5½ and 7½ ft.; distance between centers, closed, 36 and 60 in., extended, 54 and 96 in.; swing over bed, 14½ in.; swing over carriage, 10 in.; swings through gap, 24 in.; weight, of 5½-ft. machine crated, 1580 lb., of 7½-ft., 1850 lb.

## The Accessory Corner

#### Dimmer for Headlights

An equalizer which produces an almost uniform light for the headlamps of the Ford, regardless of the engine speed, is made by the 4-A Products Co., Charles building, Denver, Col. It has for its operation a make-and-break circuit switch which has no springs or moving parts. The dimmer equalizer is a different type from the straight equalizer and has a dimming

switch on the steering column so that the intensity of the headlights can be varied at will. The price of the straight equalizer is \$5, while the dimmer equalizer is \$6.

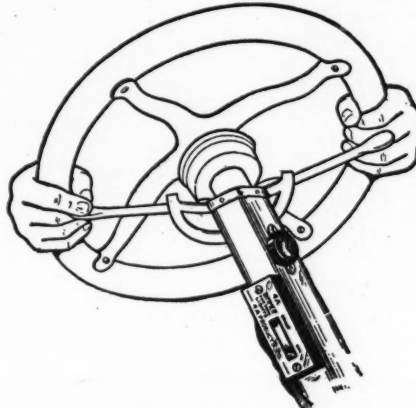
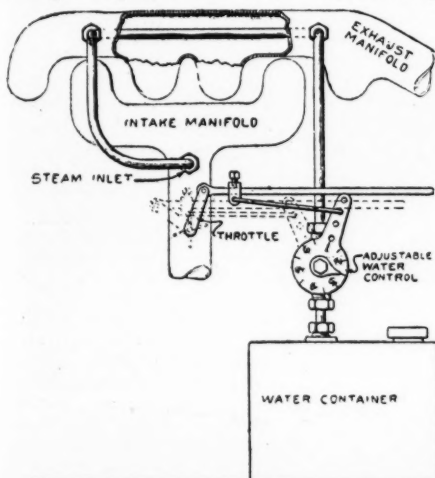
#### Over-Way Garage System

The Over-Way garage system is used for lifting passenger cars and heavy trucks on end so the workman can work conveniently underneath in repairing parts on the under side of the car. It is also for lifting heavy units such as engines, differen-

tials and transmissions and carrying them from the parking floor to the repair division. The device saves time and labor as well as avoiding danger to workmen and machines. It is made by the Richards-Wilcox Mfg. Co., Aurora, Ill. The concern manufactures carrying systems appropriate for large or small requirements and furnishes engineering service for plans covering installations of either standard or special equipment.

#### Douglass Steam Generator

The Douglass steam generator for manifold injection, which is made by the Douglass Steam Generator Co., 566 East Genesee street, Syracuse, N. Y., obtains its heat from the manifold and is automatic in supplying the proper quantity of steam according to the throttle opening. The water from which the steam is generated is drawn from a tank and the amount sucked up is regulated by a needle valve which is opened when the throttle is opened and closed when the throttle rod moves in the other direction. A portion of the pipe passes into the exhaust manifold and out again, and the heat thus supplied generates the steam. Reference to the illustration will explain the method of attachment and operation.



Above, equalizer for headlamps of Fords, and left, Douglass steam generator

# Among the Makers and Dealers

**BLEILER Is Special Representative**—J. B. Bleiler has been appointed special representative of the truck tire division of the Republic Rubber Corp., Youngstown, Ohio.

**Top Builders Merge Business**—Two of the largest top-building concerns at Memphis, Tenn., have just merged, the J. G. Stone Auto Top Co. and the Memphis Auto Top Co., under the name of the J. G. Stone-Croce Auto Top Co.

**Tractor Contract for Truck Dealer**—The American Engine & Tractor Co., Charles City, Iowa, has closed a contract for 300 Matchless American 15-30 farm tractors with the Brehm-McMullen Co., distributor of Acme trucks in Minneapolis, Minn., at \$1,895.

**Wolfe Now in National Service**—William S. Wolfe, assistant chief experimental engineer of the Goodyear Tire & Rubber Co., Akron, Ohio, has entered the service of the maintenance division of the Motor Transport Corps. He has had six years' experience with Goodyear.

**Bartholomew Gets Avery Office**—A. Y. Bartholomew has been appointed assistant sales manager of the Avery Co., Peoria, Ill. Mr. Bartholomew is the son of J. B. Bartholomew, president of Avery, and was vice-president of the Bartholomew Co., maker of Glide cars.

**Goodrich Managers in Conference**—All the heads of departments and the managers of the different branches of the B. F. Goodrich Rubber Co. were called to Boston this week for a conference on the tire situation, particularly as it affected the sale of pneumatics and truck lines.

**New Sales Concern Organizes**—The Sprake Sales Co., Inc., Los Angeles, Cal., has been organized to represent manufacturers and now represents several makers of accessories. G. T. Sprake, president, for twenty-one years was tool buyer for two large St. Louis houses. The company will travel two or three men to the jobbing trade only.

**Dependable Truck to Have Plant**—Plans have been approved for the factory of the Dependable Truck & Tractor Co., Galesburg, Ill. The structure is to be 100 ft. by 300 ft. and will be completed about Dec. 1. In the meantime trucks will be manufactured in temporary quarters. H. C. Pfaff, sales man-

ager, had charge of an exhibit of the trucks at the Illinois state fair in Springfield.

**Bergie Opens Pacific Branch**—The Bergie National Spark Plug Co., Rockford, Ill., has opened a new Pacific coast branch office in San Francisco, Cal. H. G. Smith has been appointed manager.

**400 Ford Men in Overseas Unit**—There are now 5000 stars in the service flag of the Ford Motor Co. at Detroit. Among those who are represented in the flag are 400 repairmen serving in France as a unit.

**Falls Motors Corp. Continues to Add**—The Falls Motors Corp., Sheboygan Falls, Wis., has broken ground for another factory addition, 60 by 176 ft., of brick and steel, to provide the additional facilities required to handle its Government contracts for vehicle and aircraft engines.

**Jobber Prepares for Super-Tire Service**—The Acorn Tire & Repair Co., Chicago, jobber and dealer, has just moved into larger quarters and in addition to a complete line of all standard makes of pneumatic tires is now in position to supply the trade with all standard brands of solid truck tires. Modern appliances for the speedy handling of truck wheels have been installed.

**Bailey Company in New Plant**—Though the George D. Bailey Co., Chicago, is little more than a year old, the demand for its product, the Bailey ball thrust bearing for Ford and Chevrolet 490 cars, has forced it to move into a new factory. The plant is equipped with \$75,000 worth of the latest type of machinery for manufacturing not only the Bailey ball thrust but the new Bailey product, the RC magneto coupling for trucks, tractors and passenger cars.

**Buick Starts Work on Two New Units**—The Buick Motor Co. will erect two new factory buildings to aid in Liberty engine production. The one building is a two-story structure, 80 by 240, to cost \$77,760. It will be used to take care of the overflow production of eight-cylinder Liberty engines from plant No. 11. The contract calls for completion by Nov. 1. The other structure is a two-story aluminum foundry, 120 by 300, in which will be the melting room, molding floor and core room, and a front building, 90 by 240 ft., in which the

cleaning and sand-mixing rooms are to be located. The estimated cost of the latter building is \$163,500.

**Vacuum Muffler Increases Capital**—The Vacuum Muffler Co., New York, has increased its capital stock to \$200,000. The new name will be the Vacuum Muffler Corp. of America with the following officers: President and treasurer, Oluf Kiaer; vice-president, Gunnar Hartman; secretary, D. K. Keller, and general manager, C. S. Shuman.

**Lober Radiator Enlarges Capacity**—The Lober Art Brass & Specialty Co., Toledo, Ohio, manufacturer of motor car radiators, has leased more space and will double the capacity of its plant. New equipment is being installed. Greatly increased demand necessitated the enlargement.

**Shuler Axle Expanding for War Work**—The Shuler Axle Mfg. Co., Detroit, has increased its capital stock from \$150,000 to \$200,000 to allow for further expansion of its plant to meet Government requirements. The company is already on a 95 per cent war basis, indirectly, furnishing axles to manufacturers who have received Government orders. The company is concentrating on axles for commercial vehicles, trailers and Army trucks.

**Iowa Dealers Beat Illinois Dealers**—Scott County baseball players, composed of Iowa dealers, proved too fast for the Illinois dealers in the baseball game that was a feature of the annual picnic of the Tri-City Automobile Dealers' Association. Races and other athletic sports enlivened the day. Two hundred dealers with their families took part in the outing. At the close of the day the surplus food and some motor car accessories were sold at auction, \$80 being realized for the Red Cross fund.

**Amazon Buys O'Neil Tire Accessory**—The Amazon Rubber Co., Akron, Ohio, has purchased the tire accessory business of the O'Neil Tire & Rubber Co. The purchase includes the exclusive right to the name "O'Neil" as an accessory trade name, all unfilled orders and the good will. The addition to the Amazon business will be conducted under the name of O'Neil Pioneer accessories and will include reliners, wing blow-out patches, lace-on boots, cementless patches, etc.

**Aluminum Castings Adds to Plant**—The Aluminum Castings Co., Cleveland, Ohio, is enlarging its plant for war operations. Work is being completed on one building, 120 by 260, and two more buildings will be constructed on the adjoining land. One of these buildings, which will be used as a core room, is 140 by 260 and costs \$100,000. The company also is erecting sand bins, 32 ft. high, in a building 150 by 460, at a cost of \$150,000. When the two buildings are completed the Aluminum Castings Co. will have six buildings in a group.

**Former Ford Men Take Over Agency**—The Lockwood, Mandel, Schwarzman Motor Car Co., Bloomington, Ill., has been taken over by Dayton Keith, former manager of the Chicago branch of the Ford Motor Co. For several weeks prior to the sale the new owner had been in charge of the distribution of Fordson tractors in the central Illinois territory. The new concern will be known as the Dayton Keith Co. Kelly R. Johnson, formerly sales manager of the Chicago branch of the Ford company, will be associated with Mr. Keith. Harry Morris, former service manager of the Chicago branch, will have charge of the mechanical department at Bloomington. Joseph E. Lockwood, manager



**FEDERAL TRUCK WITH JAPANESE OWNER**—The Japanese around San Francisco and other California cities handle a great deal of tea, barley and rice, and trucks are used in large numbers. This shows a Federal used by a Japanese company



of the L. M. S. Co., will be retained by the new proprietor. There will be no change in the general plan of operation, excepting that Fordson tractors will be distributed in addition to Ford cars.

Pioneer Dealer Enters Army—August A.

Jonas, president and general manager of the Jonas Automobile Co., Milwaukee, Wis., who has been a distributor of the Cadillac since the days of the famous "one-lunger," has accepted a commission as a first lieutenant in the Quartermaster's Department. He will

have charge of requisitioning and supplying all parts for Cadillac cars used by the United States army in this country and in Europe. His duties also will refer to the purchasing and routing of new cars. Thus does the trade contribute men to the nation.

## Hints for Drivers of Motor Cars

### Help for Inexperienced and of Interest to Veteran

**T**HERE are a few points about the operation of the motor car which are not generally known by any except the most well-informed drivers. They are even unknown to many drivers who may be called experts through their long familiarity with the handling of the car. A knowledge of some of these finer points in the operation of the car will add to the enjoyment of driving and give the driver greater confidence in his own ability. A few of these points often disregarded by drivers are mentioned here with the knowledge that they will surely help the inexperienced and may prove interesting to the veteran.

#### When Coasting

When coasting down a long hill, it is a decided advantage to throw the gear lever into neutral position, thus allowing the car to coast without turning the engine over. The same result can be obtained by holding the clutch out, but this imposes very undesirable wear upon the clutch throw-out, whether it be rollers, ball bearings or lubricated friction surfaces. The absolute quietness of the car when running with the transmission thus disconnected from the engine is a joy in itself. When engaging the gears again at the bottom of the hill, do not throw the clutch out before shifting the control lever into high speed but slightly accelerate the engine, keeping the foot off the clutch pedal, and gently slide the lever into the high-speed notch. If an attempt is made to re-engage the high speed by throwing out the clutch, a clashing of gears will result, as the clutch shaft will be practically stationary, while the driveshaft will be revolving with considerable speed.

Do not disengage the clutch when braking the car on slippery streets. The differential acts as an excellent equalizer for

the brakes if the weight of the engine is left on the drive-shaft. Prove for your own satisfaction the great advantage of keeping the clutch engaged by throwing the brake on hard on a wet pavement with the clutch set and the car moving rapidly and doing the same thing with the clutch remaining in engagement. If it is necessary because of the extreme slipperiness of the pavement to drive more slowly than is possible on high speed, do not throw the clutch out of engagement and coast but drop immediately into a lower speed so that the equalizing effect of the engine may be retained on the rear wheels should it be necessary to make a quick stop.

Learn to use the spark control properly in driving your car. A thorough understanding of the operation of a gas engine is essential to the proper handling of the spark control and is something that every driver should acquire. If the spark is retarded just sufficiently when the engine shows signs of laboring on a hill, it will relieve the strain on the engine and increase its power at slow speed. When accelerating the speed of the car the engine will pick up more rapidly and with less tendency to knock if the spark is slightly retarded. The spark should be so adjusted

that it can only be advanced to its farthest point when the engine is running at very high speed without much load on it, as, for instance, when running fast on a smooth level stretch of road. Study out the functioning of the spark in relation to the various conditions under which the engine operates and you will gain a more intelligent idea of its usage.

You can go up a hill faster and will burn less gasoline in doing so by dropping into second speed rather than by keeping in high if it is necessary to keep the throttle wide open when the engine runs slowly and cannot accelerate. The strain on the engine is very excessive when it is being forced up a hill at slow speed with the throttle wide open. It is an evidence of poor driving to force an engine to labor on high.

Do not think that you demonstrate skill or driving ability by making a quick getaway. You will have visible evidence of the inadvisability of this when you see your tire bills, but there is greater harm done, which you are not so apt to see, in the rear end and transmission of your car. Nine out of ten stripped pinions and rear axle keys can be attributed to this foolish practice.

## Maxwell Truck Averaged 197.8 Miles Record for Transcontinental Trip

**D**ETROIT, Sept. 7—In making public the record of the Maxwell truck which covered the 3428.7 miles from San Francisco to New York in seventeen days, 8 hr. 20 min., the Maxwell Motor Sales Corp. states that the trial was made with the idea

of establishing records that would show the business men of America that an efficient, light-duty truck, at truck speed, was capable of more mileage than the 30 to 80 miles a day believed by many to be the limit of truck performance.

The truck averaged 197.8 miles each day on the road and beat fast freight train time, which is twenty days across the continent, two full days and a half. The average running time of 16.54 m.p.h. on the road gave a fuel consumption of 11.70 m.p.g. of gasoline and 326.54 m.p.g. of oil.

Ray McNamara, Maxwell's record breaker, drove the entire distance. At the end of the trip the truck was found to be in perfect running order, and the tires, which were United States Nobby cord, had original air in them.

The truck crossed thirty-one mountain ranges in all, passed through eleven states, and carried a load of 2200 lb., including army supplies routed from Australia to France by the Lincoln highway. From the Golden Gate the truck made Reno, Nev., in 15 hr. 15 min. This stretch involved a steady climb of 98 miles to the summit of the Sierras, an elevation of 7300 ft. This was a run of 275 miles, a truck record.



MAXWELL TRUCK RECORDS MAKE GOOD SHOWING—Maxwell truck on its arrival in New York. Ray McNamara, who drove the truck, is shown at the left in front of the truck

# From the Four Winds



**MOTOR SPRINKLERS SAVE MONEY**—This shows a motor sprinkler in operation on the streets of Los Angeles. The first year the city used motor sprinklers a saving of 22 cents a mile was made as compared with teams

**TO Eliminate L. H. Grade Crossings**—Nevada will eliminate grade crossings on its section of the Lincoln highway. The highway between Reno and Carson City will be relocated to this end, and approximately 20 miles of new road will be built. But one railroad crossing will remain, and this will be so handled that an open view of the tracks in both directions will be provided.

**Jackson-Grand Rapids Highway Considered**—Construction of an improved road between Jackson and Grand Rapids, Mich., with convict labor will be considered by the Michigan penology commission following an inspection tour of various penal institutions of the state soon. The proposed highway would be built to Grand Rapids via Ypsilanti to the Detroit highway, thence to Lansing, Portland and Ionia.

**Battery Stations Aid War Stamp Sales**—Battery service stations are the latest agencies for increasing the sales of thrift stamps in Lansing, Mich. Testing and watering batteries is done without any money going to the owners, but motorists are required to purchase at least one 25-cent bond. The new source of sales is expected to materially increase the number purchased, as practically every car in the city requires such service at least every two weeks and some every ten days or a week.

**Iowa Celebrates Paved Road**—The first paved road between two cities in Iowa was opened formally with appropriate ceremonies at Mason City recently when the dedication of the Mason City-Clear Lake road was held. The day was made a holiday by both cities and Lieutenant-Governor Ernest Moore, Lafe Young, chairman of the State Council of Defense, and John A. Seneff, of Mason City, made the principal speeches. At the conclusion of the exercises a parade started from Mason City and crossed the new paved road. The road was started by popular subscription in 1913 and was completed by state and federal aid. It is ten miles from the center of Clear Lake to the center of Mason City and the road is from 16 to 18 ft. wide. It is to be completed with a 4-ft. gravel shoulder on each side. The cost of the road was about

\$15,000 a mile, and about 200 carloads of Iowa-made Portland cement was used in the construction.

**California Fees Are \$3,275,311**—Up to date California has collected \$3,275,311 in registration fees. Registrations are: Cars, 319,250; motorcycles, 22,098; chauffeurs, 10,975; car dealers, 2136; and motorcycle dealers, 166.

**Wisconsin Licenses Amount to \$2,049,680**—Wisconsin motorists paid \$2,049,680 in registration and license fees during the fiscal year ended June 30, 1918. For the previous period the income was \$834,142. The large gain is due both to the doubling of fees in Jan. 1, 1918, and the vast gain in the number of cars registered. Since the beginning of the present year, private owners pay an annual fee of \$10, instead of \$5; dealers pay \$25, instead of \$10, and trucks pay a graduated fee according to weight, ranging from \$15 to \$25, instead of the flat fee of \$5 formerly in effect. Under the present law, 75 per cent of the

license money is allotted to the state highway fund and 25 per cent is returned to the county of origin for highway purposes. Formerly this was reversed, but a change was made upon the adoption of the state trunk highway system of 5,000 miles a year ago.

**Motorist Reports 16 M. P. G. on Tour**—J. S. Bell of Bellwood, Neb., has reported to the Haynes Automobile Co., Kokomo, Ind., that his average on a 2115-mile trip from Nebraska to Long Beach, Cal., was 16 m. p. g. A ½-ton trailer was used for more than 1000 miles of the trip.

**Aviators at Tri-State Fair**—An extensive aviation program has been planned for the Tri-State fair at Memphis, Tenn., Sept. 21-28. One entire day will be set aside as aviators' day, when the flyers from Park Field, near Memphis, will stage an exhibition for fair visitors. The machines probably will fly from Park Field to the fair grounds. Mechanics and repair men with supplies and other necessities will come in Army trucks.

**Motor Truck Line Proves Success**—The establishment of a motor truck line between Coatesville, Philadelphia, Pa., and New York in conjunction with the Conastoga Traction Co. has proved so successful that tariffs have been cut. The line was opened to tap the rich agricultural section through Lancaster and Chester counties to enable the transportation of fresh produce direct from the farms to the cities mentioned. Every afternoon large quantities of butter, eggs and vegetables are picked up at the trolley line, transferred at Coatesville to the trucks and New York is reached in time for regular morning delivery.

**Illinois Road Association at Chicago**—The Illinois Highway Improvement Association, which is conducting the campaign in the state in behalf of the \$60,000,000 good roads bond issue, has opened headquarters at the Hotel La Salle in Chicago. It is the purpose of the headquarters to furnish speakers for meetings at farmers' institutes, chautauquas, county centennial celebrations, fairs, etc., as well as to distribute maps of Illinois showing the proposed state-wide road system to be built after the war with the funds derived from the bond issue if approved at the general election in November. A moving picture, "Through Illinois Over Unchanged Roads in a World of Change," has been produced under the auspices of the association.

**Women Help Pennsylvania Road Work**—Among the work being taken up by women in Pennsylvania is that of road maintenance. A report has been received at the state highway department that women have been seen driving road drags on highways in the southern tier of counties. Women also have been reported as plowing and engaged in farm work generally throughout the state. Road building contractors in Pennsylvania are beginning to feel the pinch of war, according to letters to the state highway department, which is being importuned to obtain permits from the Government for road construction material so that the men who have been awarded contracts can start the work. Several construction jobs are reported to have been held up by uncertainties as to when essential materials can be available. Arrangements have been made whereby the state highway department, which uses a large quantity of oils and other road maintenance material, passes upon requisitions for materials for road work. Road contractors have been experiencing much difficulty in obtaining unskilled labor.

## Coming Motor Events

### SHOWS

Sept. 8-14—Milwaukee, Wis., state fair show.  
Sept. 14-21—Chicago, Automotive and Accessories Exposition.  
Sept. 14-17—Dallas, Tex., seventh annual motor car show.  
Oct. 12-19—Atlanta, Ga., Southeastern fair.

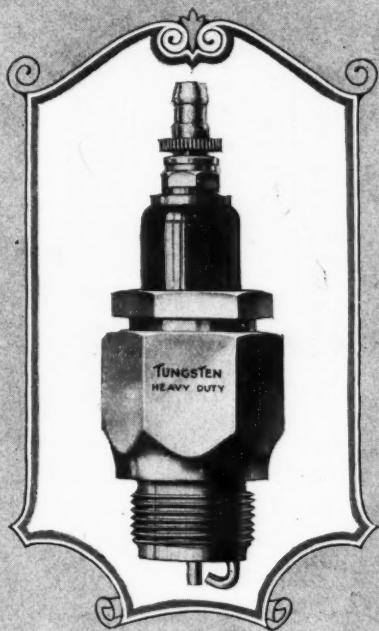
### TRACTOR DEMONSTRATIONS

Sept. 9-14—Syracuse, N. Y., state fair.  
Sept. 9-15—Madison, Wis., state fair.  
Sept. 17-20—Riverhead, L. I., county fair.  
Sept. 19-21—Harrisburg, Pa., state and national.  
Sept. 30-Oct. 4—Trenton, N. J., fair.

### CONVENTIONS

Oct. 28-Nov. 2—Chicago, N. A. A. J.





# Power

**TUNGSTEN**  
TRADE MARK REGISTERED  
**SPARK PLUG**  
**Always on the job**



**TUNGSTEN MFG. CO.**  
**MARSHALLTOWN IOWA**

# Strom

## BEARINGS

### FORMERLY U.S. BALL BEARINGS

**S**PEED is today the Nation's need—speed in industry, speed in transportation, speed in every activity that hastens victory.

In machine tools, aeroplanes, motor trucks, tractors and tanks—Strom Bearings translate the last power impulse into speed producing energy.

Friction is speed's greatest enemy. Strom Bearings practically eliminate friction. By multiplying horse-power they save man-power. By saving man-power they speed up the winning of the war.

Strom Bearings are built strong and husky—to stay in service and to do their work at a minimum cost. The balls are big. The raceways have deep grooves with no notches to weaken them.

If you are interested in the bearing question, booklets, "Calculating Bearing Loads" and "The Lubrication of Ball Bearings," will be sent you free, upon request.

**U. S. Ball Bearing Mfg. Co.**

(Conrad Patent Licensee)

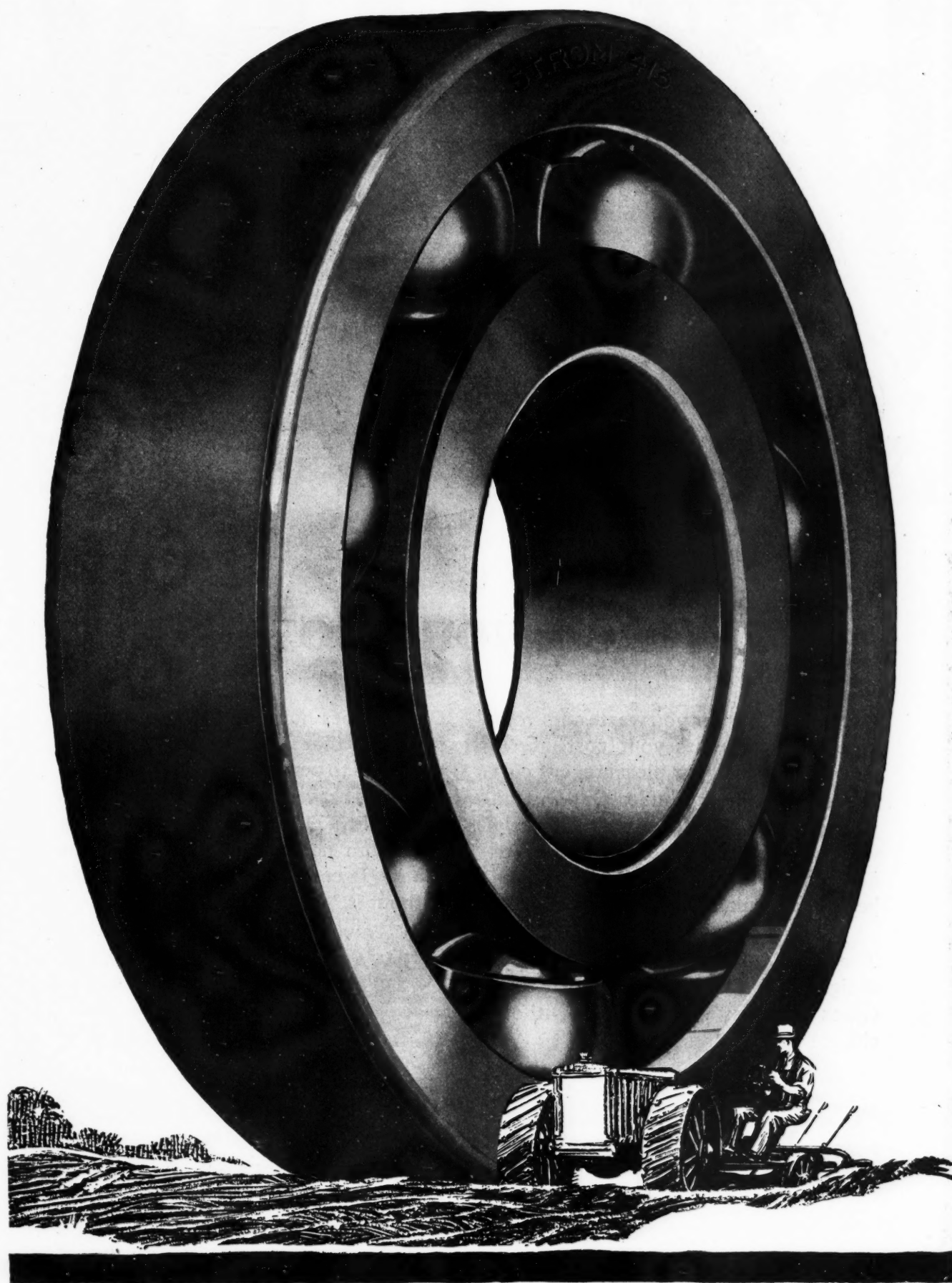
Palmer Street and Kolmar Avenue

Chicago, Illinois

(7)

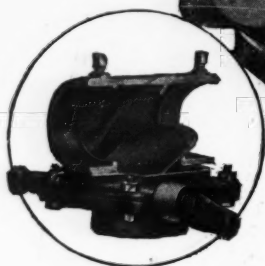






When Writing to Advertisers, Please Mention Motor Age

Sectional view  
showing paten-  
ted gas - tight  
tongue - valve  
open



*"Tells  
the motor's  
Secrets"*

## Watch your power

Every bit of power you waste cuts your speed and increases your cost. Save power, increase your pleasure, cut cost by putting a G-P Muffler Cut-Out on your car. With it you know definitely what your engine is doing. If a cylinder lays down, the G-P will tell you long before your unaided ear.

The G-P Muffler Cut-Out is simple in design and strong in construction. Gases exhaust freely and without chance of back-pressure.

Carbon does not accumulate. Built so staunchly that it cannot leak. Made in two parts to permit quick and thorough access. It saves gas by keeping the engine right. Does more toward getting maximum power than any other one thing. It costs power and speed to be without it.

*Sales Department*

**EDWARD A. CASSIDY CO., Inc.**  
285 Madison Ave., New York City

*Manufacturers:*

**The G. Piel Co., Inc., Long Island City, N. Y.**

## The G-P Muffler Cut-Out





# Electricity and the Motor Car

## *First there had to be a satisfactory lamp*

Electric light was the first demand of the motorist—so it came first. But the first lamps were not entirely practical. To make them so, Willard, at the very start, co-operated with other manufacturers in developing a lamp with mechanical strength, brilliance and ability to serve well with small battery capacity.

## *Then an entirely different battery had to be produced*

Vehicle batteries first used were efficient and capable, but too big and heavy for the motor car where lightness and compactness were first requirements. Willard engineers developed a durable, capable battery that took little room. They showed how six- and twelve-volt systems lessened battery weight—increased efficiency.

## *Means for charging had to be provided*

Imagine the gasoline car owner buying electricity every day or two just as he buys gas. Possible, of course, but inconvenient. Again Willard aided—in helping to perfect generator regulation so that the battery would be properly charged at different car speeds.

## *Then electric starting became possible*

There had to be a motor to replace strong-arm cranking. Power, staunchness and reliability were essential, and current demand had to be small. Willard's long experience in battery manufacture enabled them to give valuable aid to builders of motors for this particular job.

## *Battery ignition a by-product*

The almost universal use of battery ignition is a great tribute to the dependability of Willard Batteries which makes it unnecessary to carry dry batteries or to depend on a magneto. Current for this purpose is, of course, small—but must be infallible; for ignition failure means a dead engine. High battery reliability is maintained by close attention to every detail of work done at the Willard factory.

## *The Battery is the living link in the system*

Every other part of the electrical system is dead except when the engine is running. It's the battery that starts things moving and keeps them going. So great is the importance of this living link that the Willard organization has never been satisfied to make the best battery, but has added one improvement after another.

## *Threaded Rubber Insulation; the latest contribution to car owners*

No electrical system is any better than the insulation that stands guard over the life-giving plate. All battery engineers had long realized this and it had been their dream for years to use rubber because of its great durability.

It is because Willard never lost sight of their goal—practical rubber insulation—that we have today Threaded Rubber Insulation—the one form that can be used without increasing battery size or decreasing voltage. And Threaded Rubber Insulation has done more than to make the battery better and longer lived, for it has made possible Bone-Dry shipment of batteries, which protects the buyer against getting a battery not in every sense brand new, and against having to wait for his battery after he has bought it.

*Willard Service.*

# Covert

*The final product of the  
best engineering skill de-  
voted to transmissions.*

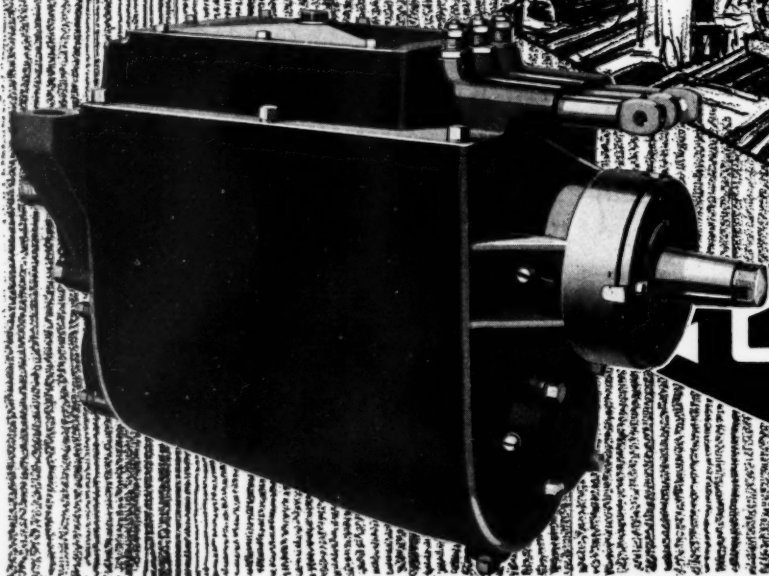
From the first operation to the completion, Covert Transmissions are examined, re-examined and tested; they are built proportionately step by step so as to give 100% performance.

Only best quality obtainable steels are used in Covert manufacturing—only the most skilled workmanship—all for one object, i. e. a transmission that will endure the hardest wear and tear—a transmission that will be efficient under all road conditions.

**Covert Gear Company, Inc.**  
*Sales, Engineering and Service*

967 Woodward Ave.  
Factories: Lockport, N. Y.

Detroit, Mich.  
Detroit, Mich.



**COVERT**  
TRANSMISSIONS





## On America's "Bread-Line"

**A**MONG many others, the Schmidt Milling Company, makers of "Honey-Dew" Flour, chose Kissel Trucks to meet a nation's wartime demands for the "staff of life."

For ten years Kissel has been designing and constructing trucks. Naturally they meet the unusual tests of the present time in a made-to-order fashion. The reliable Kissel-built power-plant, perfected worm-drive rear axle, resilient frame and dependable springs—perform the unusual in an unusual way.

*Like other prudent business men, buy trucks that have a proven record for dependable and economical service.*

**Kissel Motor Car Company, Hartford, Wis., U. S. A.**



*When you buy a really good truck—*

you will probably get one equipped with Hess-Bright Ball Bearings for it is as true of trucks as passenger cars—the best makes use them.

For their quality is a definite thing—established by years of service. The little difference in first cost is lost in the value of the service rendered and that

service is a real thing because of the manner of their making.

When you buy Hess-Brights you add an asset to your business. For weeks and months, in and out, they will do their work without failure. They will maintain their reputation in your service.

THE HESS-BRIGHT MANUFACTURING COMPANY

***Where Performance takes Preference over Price***

When Writing to Advertisers, Please Mention Motor Age



# The Firestone Demountable Rim for Giant Pneumatic Truck Tires Rests Its Case On Quality

**Q**UALITY in rims, according to Firestone standards, consists of good engineering, plus good materials, plus perfect workmanship.

These standards have given Firestone undisputed leadership in rim building from the beginning of the industry. When the tire industry wanted a rim for the giant pneumatic truck tire it naturally came to rim headquarters.

The original Firestone principle of rim construction, a continuous base wedged on in continuous contact with the felloe, stands as the foundation principle of successful rim construction.

The materials in Firestone Rims are selected and tested with the knowledge that Firestone Rim reputation must be maintained by every rim that leaves the factory.

Workmanship is guaranteed perfect. There are no "nearly rights" coming out of the Firestone plant. Workmanship is the final factor of assurance that makes Firestone Rims universally successful.

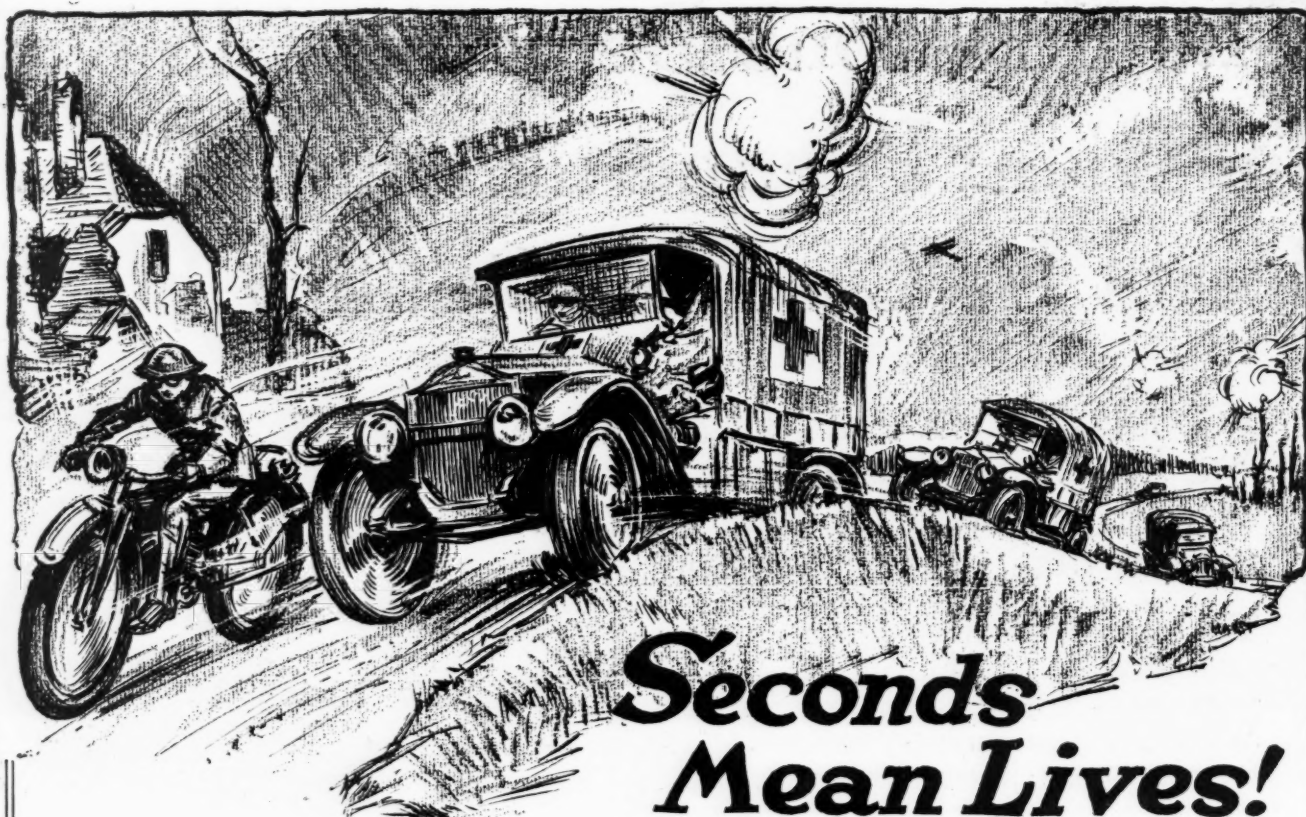
To make sure of the utmost in truck tire service, put the rim question up to us.

*The Firestone Steel Products Company  
is now producing this rim in quantities.*

THE FIRESTONE STEEL PRODUCTS CO.  
FIRESTONE PARK AKRON, OHIO

**There is a Firestone Rim for every type  
and size of tire, solid and pneumatic.**





It's the seconds saved that count big—get the wounded to the surgeon—quick—and rush back for another load.

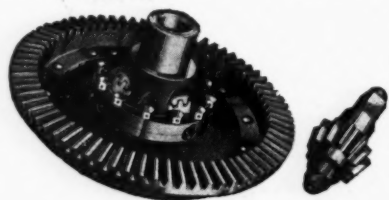
Rough roads—rocks—ruts—sudden starts and stops **demand** a differential that is dependable in all emergencies.

Since the old bicycle days this has been repeatedly proved true of

## BROWN-LIPE-CHAPIN DIFFERENTIALS

Particulars will be furnished to owners, dealers and manufacturers on request.

Bevel Type Differential for 1-ton truck as used by General Motors Truck Co.

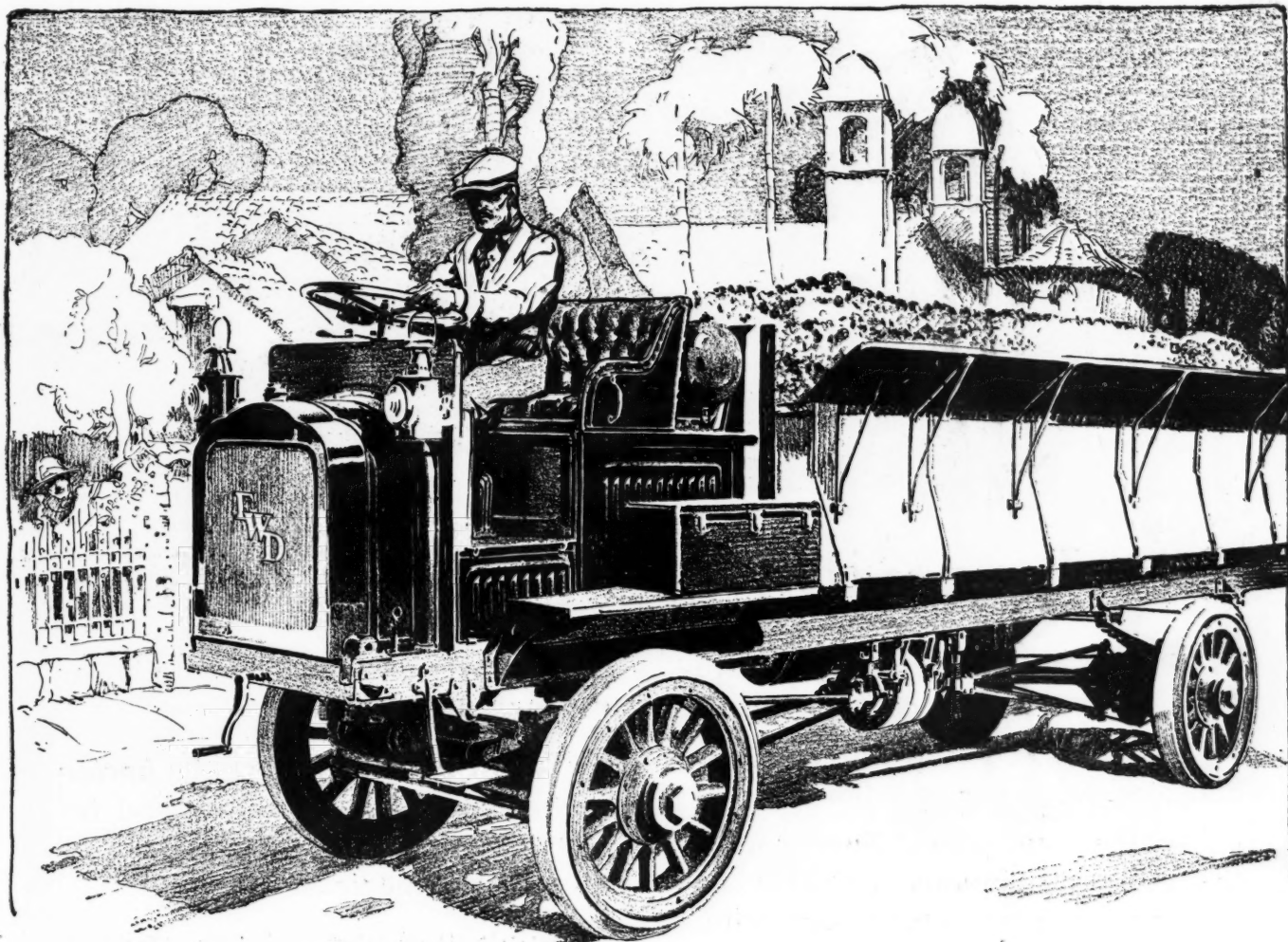


**BROWN - LIPE - CHAPIN CO.**  
Differentials  
SYRACUSE, NEW YORK

**Representatives:**

San Francisco: A. H. Coates, 41 Spear St. Foreign Agent:  
Benjamin Whittaker, 2 Norfolk St., Strand, London, W. C.





# Action

**T**HE truck that remains constantly in action is the truck that pays a profit to the owner. The F-W-D Truck in practically all industries has thoroughly demonstrated its continuous, active service.

The four-wheel-drive principle as correctly and exclusively applied in F-W-D Trucks, not only means great power, it means also great reduction of strain on the mechanism—longer service.

Our new catalog explains the details of F-W-D construction, including the correct and exclusive application of the four-wheel-drive principle. It also shows the big advantage of proper weight distribution and the advantage of the short wheel-base and small turning circle. Write for it today.

**FOUR WHEEL DRIVE AUTO COMPANY**  
Department L. Clintonville, Wisconsin

# FWD TRUCKS



## "Our Location is an Asset to You"

"People have frequently congratulated me for locating on Long Island.

"And I want to tell you men who don't know, just why I did it.

"In the first place, New York is the greatest shipping point in the country—export, import, and trans-continental. And we're in the natural factory district of New York City.

"We don't have to depend on any *one* railroad. In addition, we have water transportation constantly at hand. We are within driving distance of hundreds of rich truck markets. And embargoes West are not as strict as embargoes East—in fact we can ship faster to Omaha than Detroit can ship to Eastern markets.

"Secondly, sixty percent of our materials are produced East of the

Alleghenys—easy to get—with lower transportation charges.

"Taken altogether you get a *better built* truck for *less money* and on *shorter notice* than if we were located in the middle West.

"Think that over. Think what it means to you in cold dollars and cents.

"Then if you are interested in handling FULTONS in *your* territory—as I know you will be—I'll gladly show you how it will be a mighty profitable proposition for you."

*N. M. Fulton Melchior*  
 President

Fulton Motor Truck Company  
 Farmingdale, Long Island  
 "At the Port of New York"

Write for booklet  
 "Triple-Heated Gas"

# FULTON

## MOTOR TRUCKS

FARMINGDALE, LONG ISLAND  
 "AT THE PORT OF NEW YORK"

When Writing to Advertisers, Please Mention Motor Age



# EISEMANN

## Four Out of Five Trucks Are Eisemann-Equipped

Of the motor trucks in use in this country today, more than 80% of the makes have Eisemann ignition.

Think what that means—that for every make of truck using any other Magneto as standard equipment (not any one other Magneto, but any one of all the other Magnetos combined) there are more than four makes of trucks using Eisemann Magnetos.

And notice especially that this is the record in the truck field, the service which places upon the Magneto the most severe demands of all. The heavy loads, the long hauls, the repeated shocks, the continuous vibration and strain, have served to emphasize Eisemann superiority in efficiency, in dependability and in durability.

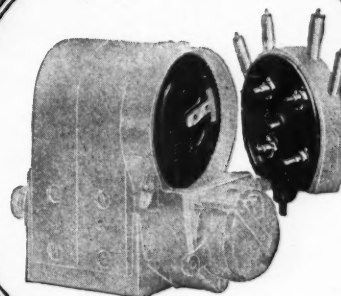
This overwhelming preference for Eisemann Magnetos is no vogue of the moment. It is a growth of years. For Eisemann was the pioneer High Tension Magneto and there has been ample time to test it on its merits. The lead established at the start never has been yielded.

THE  
**EISEMANN**  
MAGNETO-COMPANY

Sales and General Offices:  
32-33rd St., Brooklyn, N. Y.

Chicago:  
910 South Michigan Ave.

Detroit:  
85 Willis Ave., W.



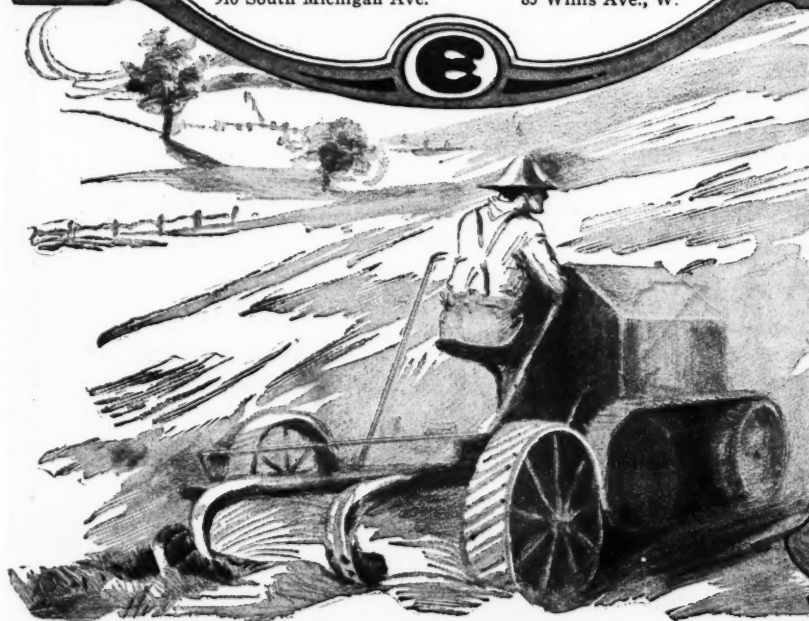
### EISEMANN SUPER-CONSTRUCTION

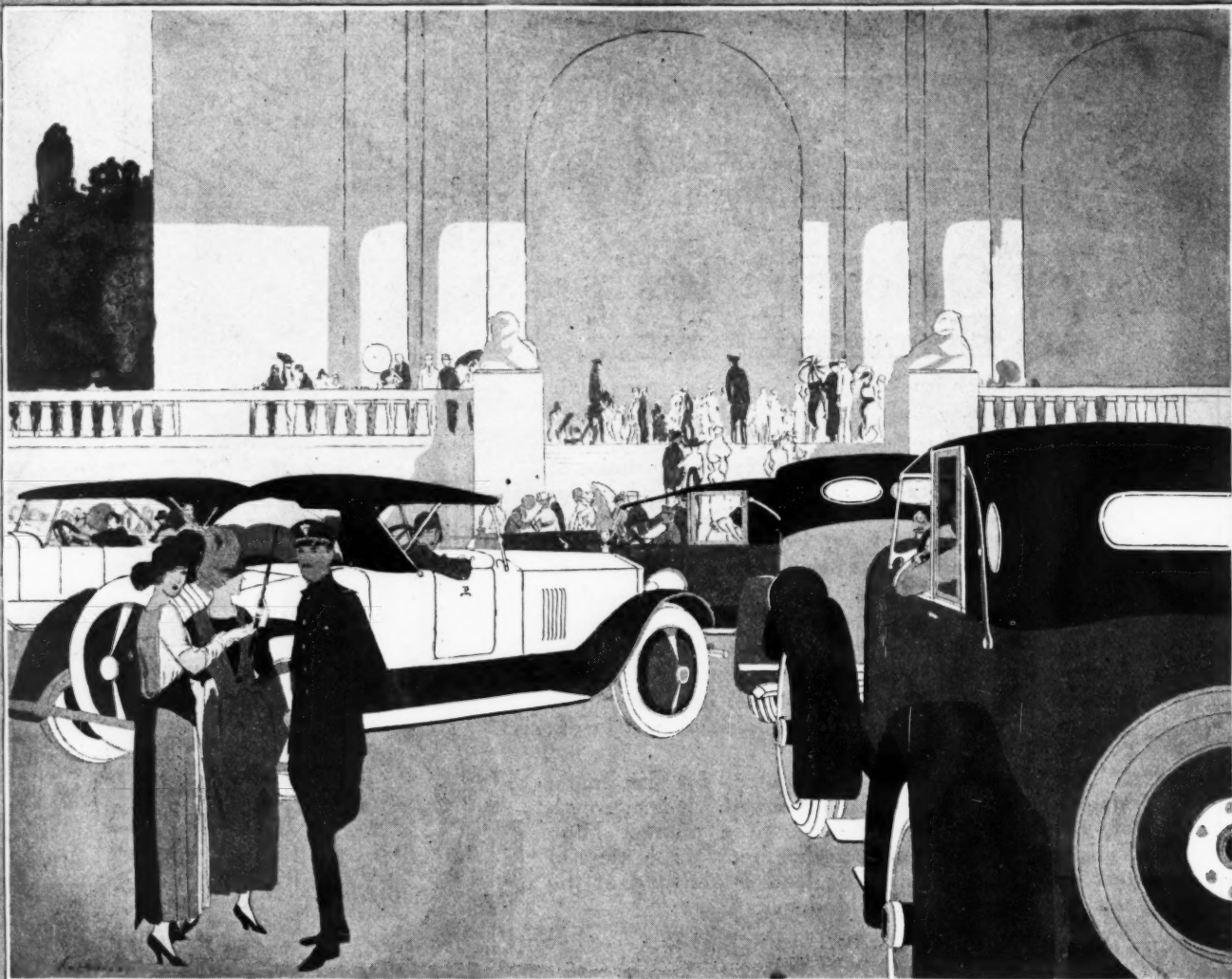
#### No. 5—The Distributor Plate and Disc

The high tension current generated in the secondary winding in the manner already described is carried directly to a collector ring. Picked up here by a carbon brush in the base of the Distributor Plate, the current is carried to the center brush, which is continuously in contact with a "T"-shaped metal insert in the Distributor Disc. As the Disc is rotated by the distributor gear, this metal insert makes contact in turn with each of the outside carbons of the Distributor Plate. The current, thus distributed, is led by high tension cables to the spark plugs.

All connections of cables with the Distributor Plate are inside and completely protected against short-circuiting by water, etc. An ingenious patented method of attaching the high-tension cables to the carbon brush holders ensures against loosening and is a most important feature.

The shadowgraph above shows the position of the Distributor Disc with relation to the Magneto as a whole. The Distributor Plate is shown detached.





## NEVERLEEK, the Guaranteed Top Material, Has the Call

Fifty and more leading car-makers have adopted NEVERLEEK as standard equipment. These men are not given to snap judgment. They chose NEVERLEEK on the sound basis of severe road-tests through the four seasons.

NEVERLEEK tailors readily. It will not leak, crack nor fade. It stays put. It has been tested under hydraulic pressure of 200 pounds to the square inch—and it didn't leak a drop. "It's always fair weather 'neath NEVERLEEK."

Thousands of car-owners will say this fall and winter, "So long, Old Top, I'm going to replace you with NEVERLEEK." And the NEVERLEEK top-makers and custom body builders are going to get the business.

Is it profitable business? Well, let us quote you from some letters we have on file. We want to hear from dealers and topmakers who can spot a live one. Write us today for samples and complete information.

F. S. CARR COMPANY

31 Beach Street  
Boston

**NEVERLEEK**

969 Woodward Ave.  
Detroit

**TOP MATERIAL**

*This trade-mark (Reg. U. S. Pat. Off.) appears  
on every other yard of NEVERLEEK lining*

*When Writing to Advertisers, Please Mention Motor Age*



# How YOU Can Get Your Share of TRACTOR Business in Your Locality

**I**N THE first place, choose your tractor connection exactly as you would a new motor car connection.

Consider the MOLINE-UNIVERSAL tractor in terms of your own business experience. Look into the tractor itself—the company, its reliability, its reputation, its ability to deliver and to co-operate. Investigate—then go ahead!

Apply this test and you will readily see how you can hook up your success with the success of the—

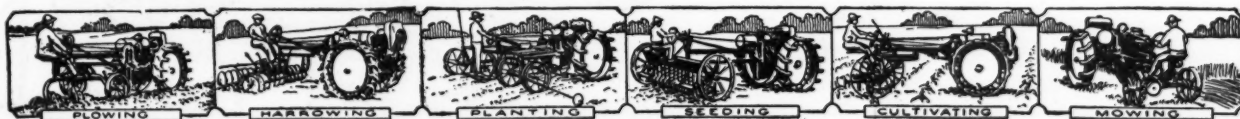
## NEW MODEL D MOLINE UNIVERSAL TRACTOR

**How about the tractor itself?** Constructionally, the Moline tractor is right. It is the original two-wheel, one-man tractor. It is built in accordance with accepted automotive engineering practice. Any motor car dealer can understand it. Moreover, the correctness of its design has been proved in performance. Its ONE-MAN feature is an exceptionally strong selling argument at this time, due to farm labor shortage.

**How about the company back of the tractor?** The Moline Plow Company has been in business since 1865. It is capitalized for \$19,000,000. Its products are used the world over, and are internationally famous. It has 22 distributing factory branches dealing direct with dealers. These branches cover the country, giving MOLINE dealers the benefit of a complete stock of repairs and expert service close at hand.

**How about deliveries?** Moline Tractors are built in the largest exclusive tractor plant in the world—operating at full capacity. We will contract only with a sufficient number of dealers to sell our output. New dealers are not appointed unless we can furnish them tractors.

**ONE MAN OPERATES BOTH TRACTOR and IMPLEMENTS**



# A TRACTOR ANY MOTOR

**I**F YOU have the ability to sell good motor cars, you will meet with no difficulties in selling Moline-Universal Tractors. Your motor car business you will find has proved an excellent training school.

Your past experience, your present organization and equipment make for immediate success. All fit ideally into the big, fast developing tractor business.

For instance, you know that **specifications** prove a good index to motor car value. The same fact holds true with tractors.

Run through Moline-Universal Tractor specifications. Note that every standard constructional unit mentioned is one with which you are already more or less familiar.

Hyatt, Willard, Remy, Bendix, Holley, Bennett, Spirex, Borg & Beck are names every motor car dealer knows. They represent quality. Their sales value is unquestioned.

The 4-cylinder motor with which the Moline-Universal Tractor is equipped is the enclosed overhead valve type which every motor car dealer has learned to admire and respect for its **POWER**.

## SPECIFICATIONS

**POWER**—9 h. p. on draw bar; 18 h. p. on belt.

**ENGINE**—Four-cylinder, 4-cycle, perfected overhead valve type with  $\frac{3}{8}$ -inch bore and 5-inch stroke. Removable head. Double valve springs make unusually quick and quiet action. All mechanism completely enclosed and self-lubricating.

**CRANK SHAFT**—Extra heavy drop-forged high carbon steel, with large crank pin bearings,  $2\frac{1}{2}$  inches in diameter; no whip or spring.

**LUBRICATION**—Force feed. Oil is forced by a gear oil pump in a constant stream through hollow crank shaft to every crank pin and shaft bearing. Every moving part, including overhead-valve mechanism, is lubricated by an oil mist.

**COOLING**—Thermo-syphon system with large water passages. Moline Spirex radiator of large size.

**IGNITION**—Special Remy ignition system with generator, distributor and Willard storage battery.

**LIGHTING**—Electric searchlight, throwing powerful beam ahead and electric light at rear of tractor over plows enable perfect work at night.

**GOVERNOR**—Remy electrical governor controls motor speed from control box within reach of the operator. By simply turning a dial, tractor maintains any speed desired from  $\frac{1}{2}$  to  $3\frac{1}{2}$  m. p. h. Governor also automatically handles all change of load. All wires in armored conduits.

**SELF-STARTER**—Remy self-starter with Bendix drive.

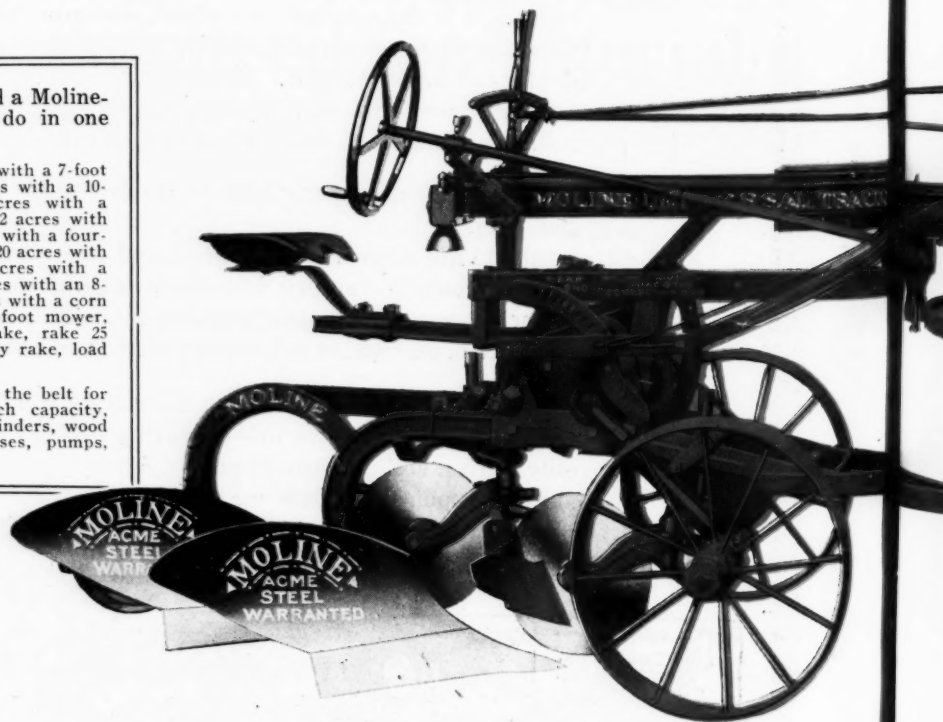
**CARBURETOR**—Holley automatic.

**AIR CLEANER**—Bennett cleaner to remove dust from air.

## HERE'S what one man and a Moline-Universal Tractor can do in one day of ten hours:

Plow 7 to 9 acres, disc 27 acres with a 7-foot tandem disc harrow, disc 38 acres with a 10-foot disc harrow, harrow 76 acres with a 20-foot peg tooth harrow, plant 22 acres with a two-row planter, plant 43 acres with a four-row planter, cultivate from 14 to 20 acres with a two-row cultivator, drill 35 acres with a 10-foot grain drill, harvest 25 acres with an 8-foot grain binder, harvest 10 acres with a corn binder, mow 25 acres with an 8-foot mower, rake 40 acres with a 12-foot rake, rake 25 acres with an 8-foot side delivery rake, load 12 acres of hay.

In addition, it can be used on the belt for running threshers up to 24-inch capacity, silo fillers, corn shellers, feed grinders, wood saws, clover hullers, hay presses, pumps, lighting plants, etc.





# R CAR DEALER CAN SELL

The Moline-Universal Tractor is electrically lighted and started—the only tractor regularly equipped with self starter and electric lighting. The starting and lighting system is a Remy. Bendix drive is used. The motor is controlled perfectly at all speeds by a Remy electrical governor. Drop forgings, heat treated parts, steel cut gears, and unusually large Hyatt bearings are used throughout.

These are selling features which do not have to be explained to you. You appreciate the advantages they give—without explanation.

In every respect the Moline-Universal Tractor has been constructed in accordance with the latest approved automotive engineering practice. No motor car is better made.

Important as its perfected construction is, the big feature of the Moline-Universal is its type. It is the **original two-wheel, one-man tractor**. Being mounted on two wheels, 98% of its weight is available for traction. This accounts for its wonderful pulling power.

**ONE MAN OPERATES BOTH TRACTOR AND IMPLEMENTS**—a tremendously forceful sales argument in these days of farm labor shortage. Another big point—the Moline-Universal Tractor is the only tractor that will do all farm work, including cultivating.

## SPECIFICATIONS

**CLUTCH**—Borg & Beck, three-plate, dry disc. Easy engagement and firm grip.

**TRANSMISSION**—One gear ratio forward and one reverse. Gears drop forged, cut and hardened. Transmission runs in oil bath. Entire transmission mounted on Hyatt high duty roller bearings in rigid air-tight grey iron housing. All gears and shafts splined—no keys used.

**DIFFERENTIAL**—Bevel type. Self-contained. Runs on two big Hyatt high duty roller bearings. Cut and hardened steel gears.

**DIFFERENTIAL LOCK**—Makes both wheels turn together. Controlled from seat. Of great value in soft ground.

**FINAL DRIVE**—Bull gears of internal type operate within a dust proof housing. Bull pinions on splined differential shafts cut and hardened steel. Lubri-

cated by heavy grease through covered opening in housing.

**DRIVE WHEELS**—52 inches in diameter, 8 inches face. Each wheel mounted on two Hyatt roller bearings. Width to outside of drive wheels 54 inches. Can be equipped with 6-inch extension rims.

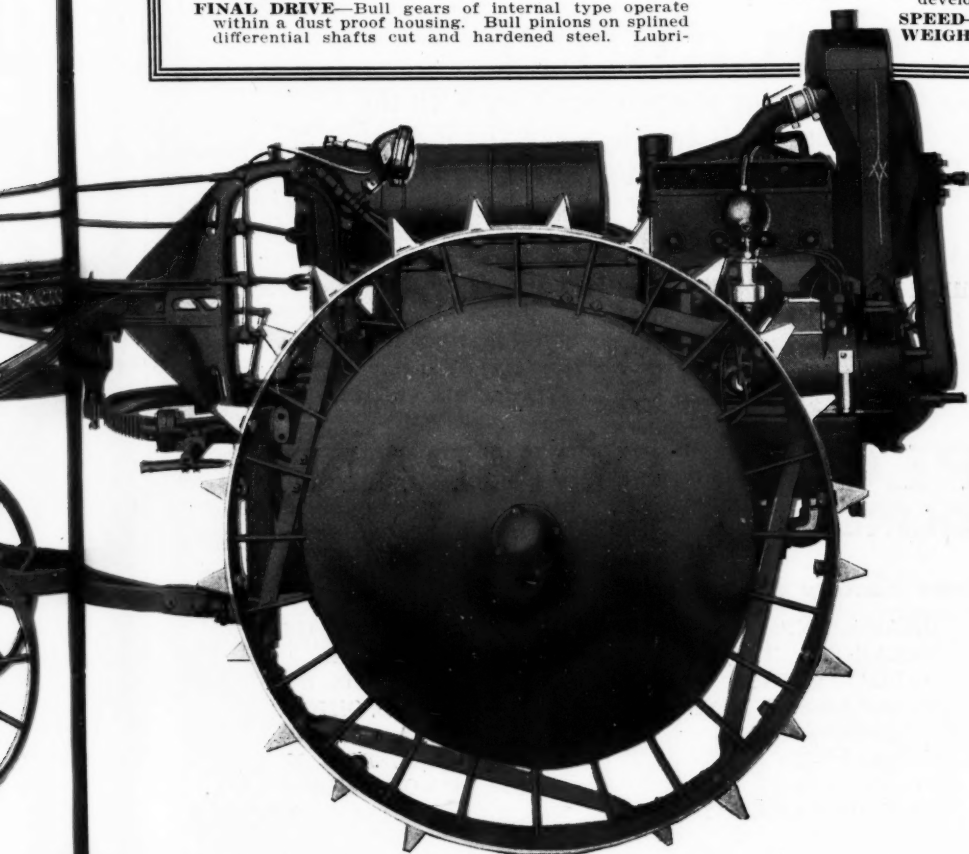
**RAISING AND LOWERING LAND WHEEL**—For plowing, one wheel runs in furrow and land wheel is raised to keep tractor level. Wheel is raised or lowered by one man with little effort without using a jack.

**CLEARANCE**—29½ inches, ample for cultivating.

**BELT WORK**—A 9-inch belt pulley with 6½-inch face. Belt travels at standard tractor belt speed. Tractor develops full 18 h. p. on belt.

**SPEED**—From ½ to 3½ miles per hour.

**WEIGHT**—3380 pounds.



## MOLINE Units

With which you are already familiar and whose selling advantages you appreciate include such names as—

Hyatt, Remy  
Willard, Bendix  
etc.

*Electrically  
Started and  
Lighted*

## Every Motor Car Dealer Who Is Qualified to Represent **MOLINE** Tractors —

—regardless of his size, or regardless of his location, owes it to his future to look into the possibilities of this fastest developing branch of the automotive industry.

If you know you can sell the Moline-Universal Tractor—

If you are now in position to apply your same successful motor car organization to the sale of Moline-Universal Tractors and Moline Implements—

If you believe yourself to be qualified in a financial and business way to represent one of the oldest and best known tractor concerns in the world—

If you appreciate the co-operative advantages to be derived from doing business with a factory branch house conveniently located to you, and always in direct connection with both factory and you—

We will be glad to take up the matter of open territory with the end in view of your becoming associated with one of the largest and most successful dealer organizations in the country.

Wire, write or visit us at the factory, and we will put you in proper touch with our nearest branch office.

## **MOLINE PLOW COMPANY** **MOLINE, ILLINOIS**

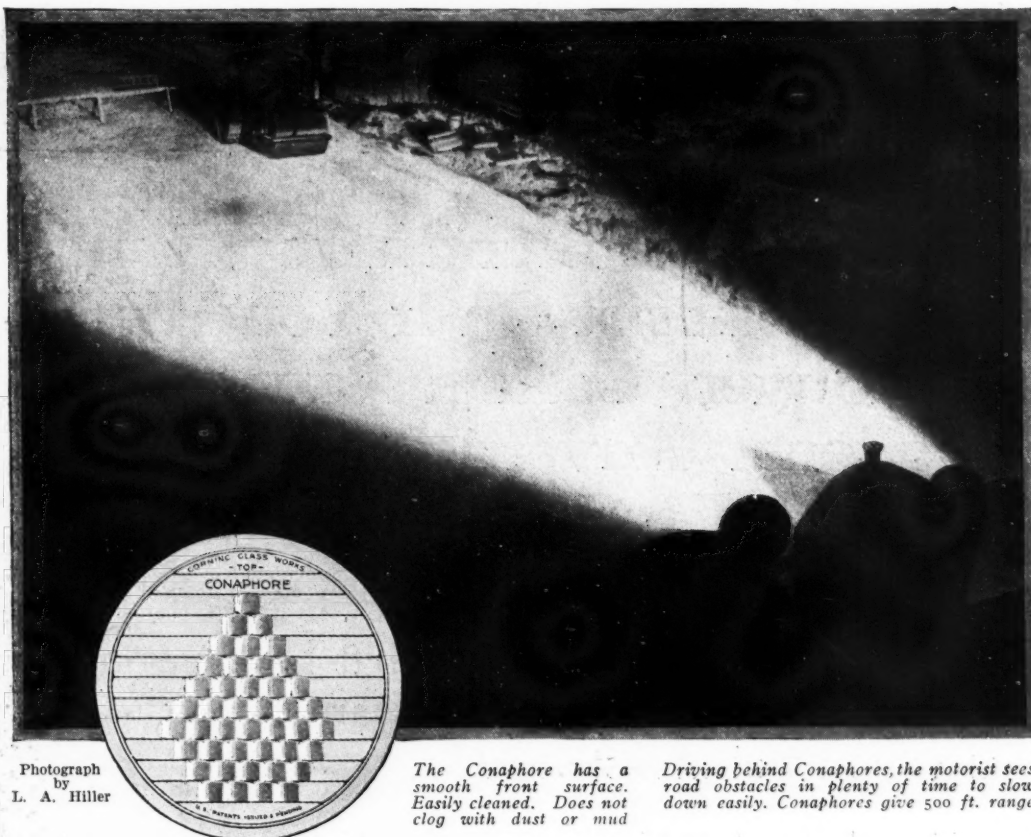
### *Direct Factory Branches at*

SPOKANE, WASH.  
LOS ANGELES, CALIF.  
STOCKTON, CALIF.  
SALT LAKE CITY, UTAH  
DENVER, COLO.  
MINOT, N. D.  
SIOUX FALLS, S. D.

OMAHA, NEB.  
OKLAHOMA CITY, OKLA.  
DALLAS, TEXAS  
MINNEAPOLIS, MINN.  
DES MOINES, IA.  
KANSAS CITY, MO.  
ST. LOUIS, MO.  
NEW ORLEANS, LA.

BLOOMINGTON, ILL.  
JACKSON, MICH.  
INDIANAPOLIS, IND.  
COLUMBUS, OHIO  
ATLANTA, GA.  
POUGHKEEPSIE, N. Y.  
BALTIMORE, MD.





The Conaphore has a smooth front surface. Easily cleaned. Does not clog with dust or mud

Driving behind Conaphores, the motorist sees road obstacles in plenty of time to slow down easily. Conaphores give 500 ft. range

## How to make your lens business return real profits

**I**F you want to cash in on your headlight glass business, don't wait for state anti-glare laws or local ordinances to send motorists to your store.

Line up with the movement to make night driving safe. Show motorists how efficient headlighting works to their own advantage—how it makes for their own comfort and safety, as well as the safety of others.

When the motorists in your territory learn the tremendous advantages of efficient headlighting, your business in lenses is due to increase.

### What Corning is doing

In national Conaphore advertising, Corning Glass Works is

emphasizing the out-and-out necessity of efficient headlighting—not merely to comply with various laws, but to make night driving comfortable and safe for all concerned.

Tie up to this constructive, business-increasing policy by pushing Conaphores.

If you have ever driven behind Conaphores, you know how their 500 ft. range gives you plenty of light far down the road; how the cylinders fan ample light sidewise over the ditches and fences; how the Noviol beam shoots through fog or dust without dangerous "back-glare."

If you have ever seen Noviol tinted headlights approaching, you know how the light is kept below

the glare level; how the unique yellow-tint serves as a "Signal of Safety."

These are the advantages which mean comfort and safety on the highways for all motorists. These are the advantages which mean ready Conaphore sales and increased profits for you.

To tie up to our national advertising get our handsome Conaphore window transparency—it marks your store as a first-class accessory depot. Mailed free for the asking.

Retail Price List (per pair)		Noviol Glass	Clear Glass
5 to 6 1/4 inches incl.		\$2.40	\$1.60
7 to 8 1/2 inches incl.		3.50	2.50
8 1/2 to 10 inches incl.		4.50	3.00
10 1/2 to 11 1/2 inches incl.		6.00	4.00

Prices 25 cents more per pair west of Rocky Mountains

Sizes vary by steps of 1/4-inch above 6 1/2-inch size

CONAPHORE SALES DIVISION  
EDWARD A. CASSIDY CO., MGRS.  
Madison Ave. and 40th Street, New York City

NO GLARE  
RANGE 500 FT.

# CONAPHORE

PIERCES FOG  
AND DUST

CORNING GLASS WORKS—WORLD'S LARGEST MANUFACTURERS OF TECHNICAL GLASS

When Writing to Advertisers, Please Mention Motor Age

## Sell the One Brand You Would Always Insist On If You Were the Buyer. Cash in Now on the National Advertising That Is Ringing Up Sales in AC Stores

Put yourself in the customer's shoes. If you were buying spark plugs—what brand would you insist on? The chances are ten to one that you would install AC's.

For you know that the manufacturers of practically every fine car have for years specified AC Spark Plugs for standard factory equipment. You know that neither guess-work nor chance could enter into these decisions. You know that AC's were selected only after rigid, scientific tests in which every spark plug made had the opportunity to qualify. And you know further that AC Spark Plugs give the best service no matter what car they are installed in. This knowledge is not confined to the automobile industry. It has been spread

broadcast among your customers by national advertising in the leading magazines. Owners of every make and type of car are becoming confirmed AC users. Leading dealers in all parts of the country, realizing this fact, are stocking AC's to the exclusion of all others.

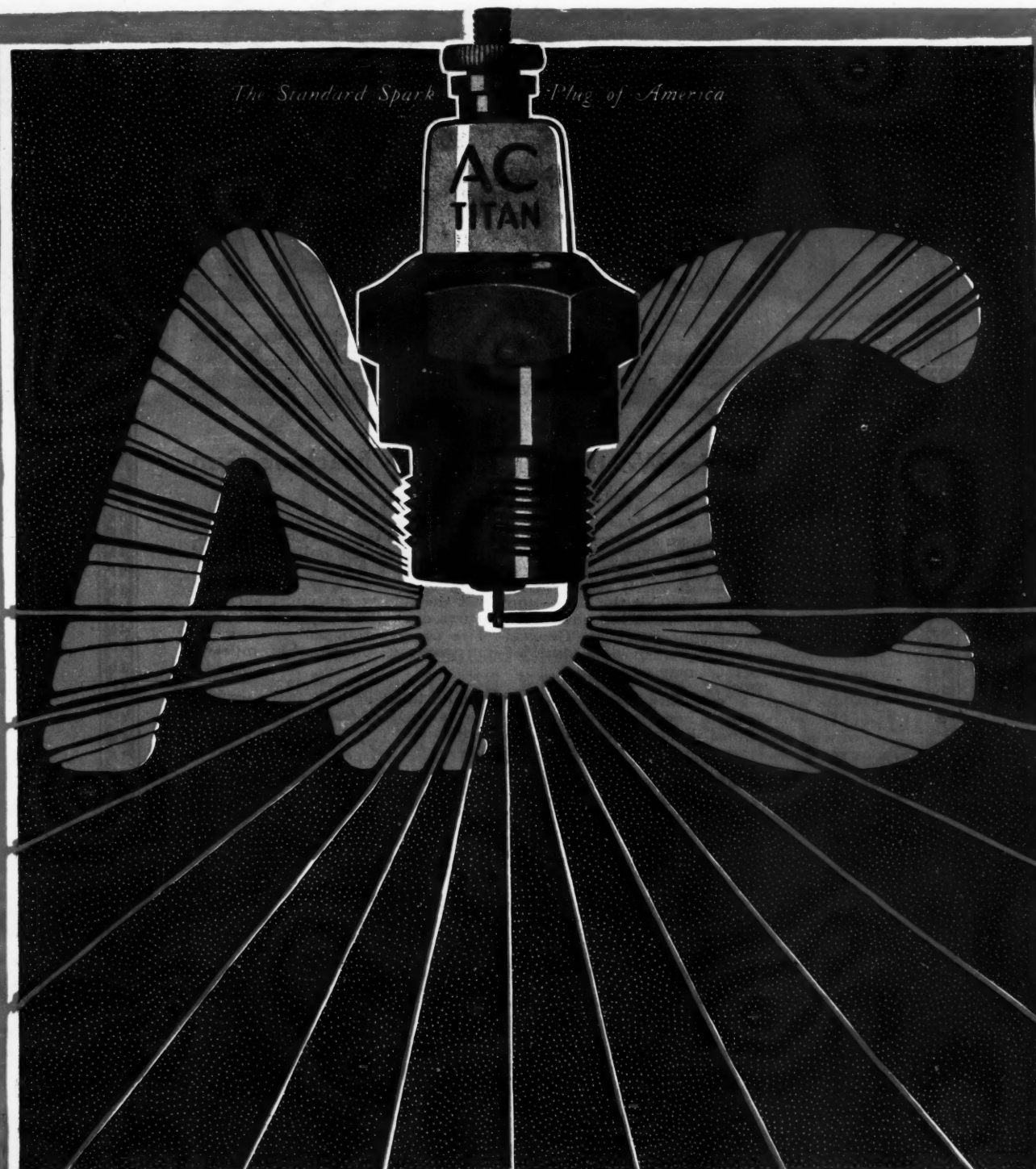
So line up now with success. Stock the complete AC line. Then you are prepared to meet best the needs of every motorist. For there are various types of AC Plugs specially designed for every make and style of motor. Write for complete dealer information.

Champion Ignition Company, FLINT, *Michigan*

U. S. Pat. No. 1, 135, 727, April 13, 1915. U. S. Pat. No. 1, 216, 139, Feb. 13, 1917. Other patents pending.



*The Standard Spark Plug of America*



**All these well known manufacturers listed below use AC for standard factory equipment**

Acme Trucks	Cole	Ford & Son Tractors	Jumbo Trucks	Nash	Reo	Stearns-Knight
Advance-Rumely	Continental	F-W-D Trucks	Kissel Kar	National	Riker Trucks	Stephens
Tractors	Motors	Fulton Trucks	La Crosse Tractors	Netco Trucks	Robinson Fire	Sterling Motors
American	Crane-Simplex	Gabriel Trucks	Liberty	Oakland	Trucks	Sterling Trucks
La France	Daniels	Genco Light	Locomobile	Old Reliable	Roch Falls	Stewart Trucks
Anderson	Davis	G. M. C. Trucks	Marmon	Trucks	Rutenber Motors	Stutz
Apperson	Deere Tractors	Gramm-Bern-	Maytag	Oldsmobile	Samson Tractors	Titan Trucks
Brockway Trucks	Delco-Light	stein Trucks	McLaughlin	Onelda Trucks	Sandow Trucks	United States
Buffalo Motors	Diamond T Trucks	Hall Trucks	(Canada)	Packard	Sanford	Motor Trucks
Buick	Dodge Bros.	Hatfield	Menominee	Paige	Saxon	Wallis Tractors
Cadillac	Dorris	Haynes	Trucks	Paterson	Scripps-Booth	Waukesha Motors
J. I. Case	Dort	Hudson	Midland Trucks	Peerless	Seagrave Fire Trucks	Westcott
Chalmers	Duesenberg	Hupmobile	Moline-Knight	Pierce-Arrow	Signal Trucks	White
Chandler	Motors	Jackson	Moreland Trucks	Pilot	Singer	Wilcox Trux
Chevrolet	Federal Trucks	Jordan	Murray	Premier	Smith Motor Wheel	Wisconsin Motors

*When Writing to Advertisers, Please Mention Motor Age*

# THE GENERAL TIRE

## Measuring the Worth of Tires With Machine Gun Bullets

During a recent test, an armored car equipped with 35x5 General Cords, passed before the continuous fire of a Machine Gun 19 times before a bullet succeeded in penetrating any of the tires.

Hundreds of projectiles hit the tires—some cut the rubber and under-surfaced material but the great resisting power of the tires during this trying test, fully demonstrated the superiority of "General" Tire construction and strength of materials—indeed conclusive evidence of the generous measure of mileage users of "Generals" may expect.

While we are at war—tire economy is of vital importance and the many virtues of "Generals" which have been proven by performance have established a standard which qualifies them for equipment on all forms of commercial cars, large or small.

Dealers who handle General Tires and realize that the dominant consideration today is the production and selling of essentials, have a broad and lucrative field before them in supplying commercial customers.

*There's a "General" for Every Car*

**They Turn Over Fast For Dealers  
Because They Turn Over Far For Users**

**THE GENERAL TIRE & RUBBER COMPANY**

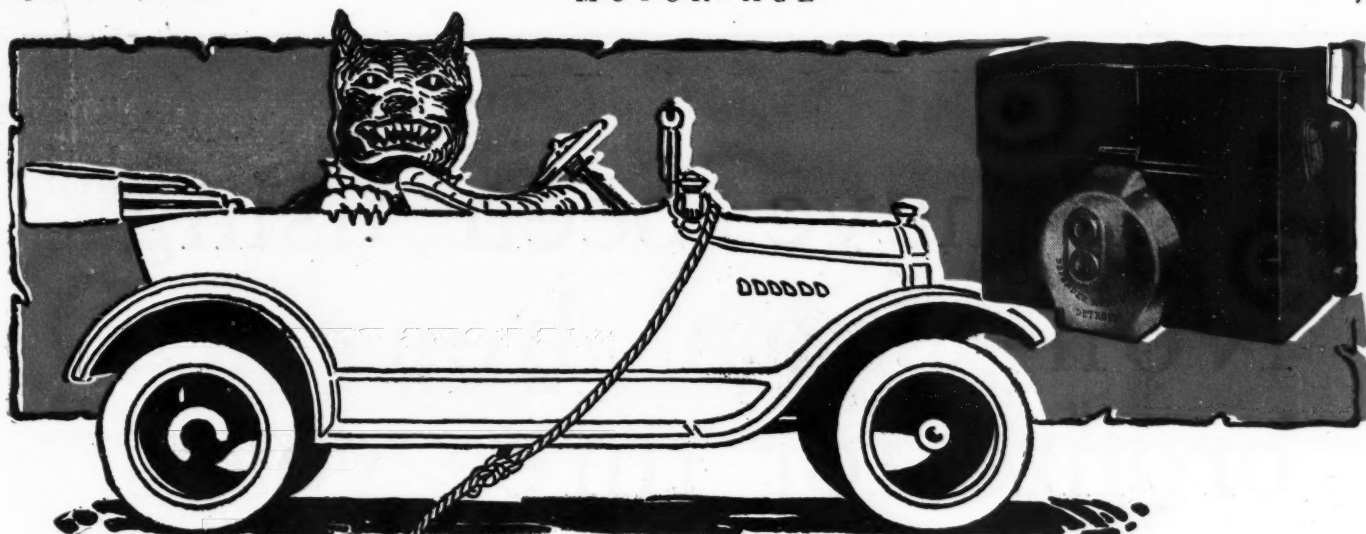
Dept. B

Akron, Ohio



*When Writing to Advertisers, Please Mention Motor Age*





## Fords are securely anchored with DEFENDER Auto Lock

Positive assurance that his Ford will remain unmolested by thieves and will BE THERE when he returns is what the Ford owner gets when he puts on a DEFENDER AUTO-LOCK. His car is safely anchored—no amount of pilfering can overcome the locking qualities of the DEFENDER AUTO-LOCK—they lock the ignition box and safely guard your coil units also.

**Cost—\$4.00**  
**Worth—the**  
**price of the car!**

### DEALERS PREFER TO SELL THE BEST

That's why DEFENDER AUTO-LOCKS are sold by thousands of dealers from coast to coast—they realize that the DEFENDER AUTO-LOCK will perform its duty and stand guard over their customer's car.

How many times have motorists said—"I must get a lock for my Ford" and neglected to do so until their car was stolen. A \$4.00 DEFENDER AUTO-LOCK would have saved them this several hundred dollar loss. A DEFENDER AUTO-LOCK is worth just as much as your customer's car for it will save him that loss. The grounding device which prevents tampering with the ignition and starting car without the use of switch is an exclusive feature of the Defender.

**WHY NOT recommend and sell the best—the DEFENDER AUTO-LOCK**

**DEFENDER AUTO-LOCK CO.**  
**5th Floor Marquette Bldg. Detroit, Mich.**

Canadian Gen'l Electric Co., Limited, of Toronto, Sole Distributors for Canada.



All Special Features of the Defender Lock Are Patented in the United States and Canada.

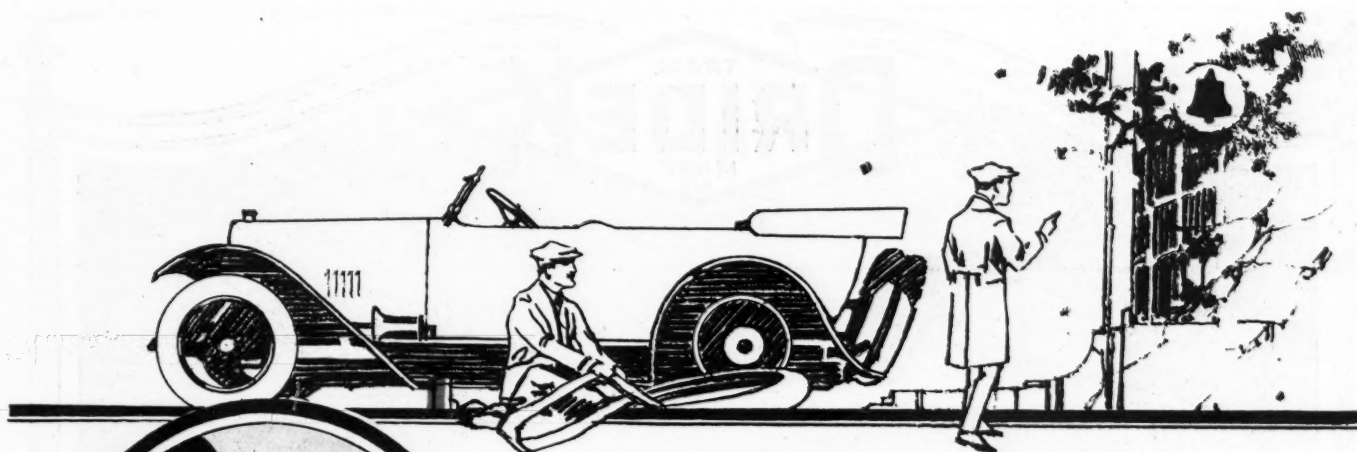
“We have been using Non-Gran bearing bronze for three years in various parts of our truck. The quality of the metal has at all times been very uniform.”

IN this positive fashion a manufacturer of motor trucks who is known best perhaps by the quality and performance of his product, has added his testimony to that of many others.



American Bronze Corporation  
Berwyn Pennsylvania





*"Never mind calling up for help—I'll have that tube fixed before anyone can get here."*

## *Perma-Loc repairs Punctures and Blowouts— PERMANENTLY—in two minutes*

THE PERMA-LOC user doesn't know what it is to be "stalled" by a puncture or blow-out. Let it happen where it may—miles from a garage or repair shop—he'll be ready for it. With knife or scissors he cuts off a strip of PERMA-LOC, applies it to the tube, inflates to full pressure, and drives away.

PERMA-LOC is a 3-ply patch of fabric and rubber, annealed together by a secret process. It vulcanizes itself

to the tube, and *can't creep* or come loose. Heat, friction and hard driving only make it hold the tighter. Once applied, it *stays*.

Safeguard yourself against future trouble and delay—See your dealer about it today.

Three size kits to choose from, 50c, \$1.00 and \$1.50, contained in a stout metal case together with necessary tube of cement.

# *Perma-Loc*

## *The Original 3-Ply Patch*

**Dealers** *The superior merit and obvious advantages of PERMA-LOC are such as to make it readily and profitably salable. It affords motorists a welcome opportunity to economize and save trouble. They are quickly convinced of its merit. Write to your jobber, or direct to us, for discounts and full details.*

**PERMA-LOC MFG. CO.**

310 Board of Trade Bldg.

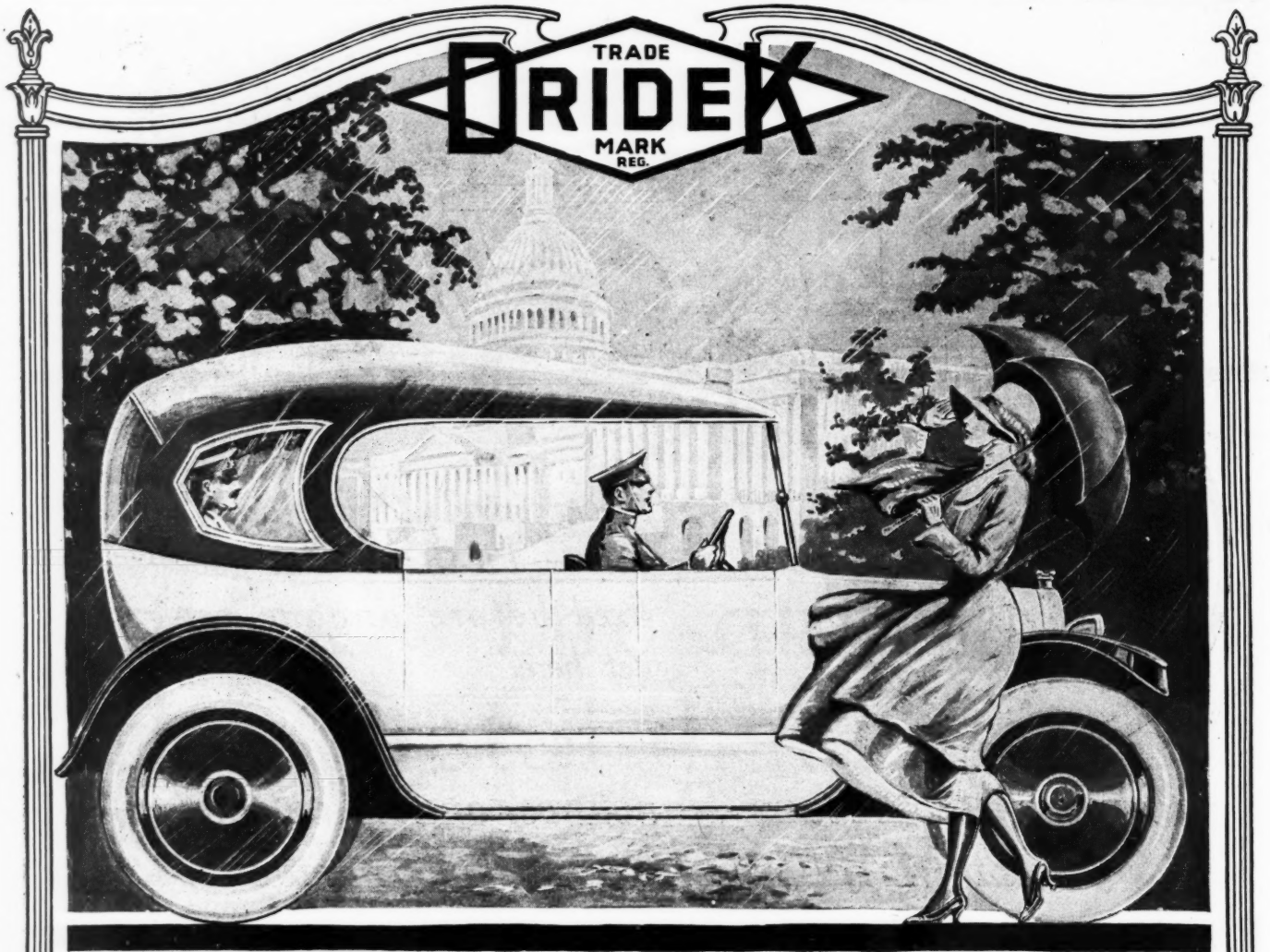
Factory:  
Wilkes-Barre, Penna.

Scranton, Penna.

When Writing to Advertisers, Please Mention Motor Age



**This Sample Size Kit**, enough patching material and cement to repair 12 average tube punctures, will be mailed, anywhere, upon receipt of 24 cents in stamps to cover the cost of postage, shipping and containers.



## A DRIDEK Top Is Absolutely Waterproof!

**DRIDEK is the Most Remarkable Material Yet Produced  
For Automobile Tops, Side Curtains and Upholstery.**

DRIDEK is soft and pliable, easy to work, does not scratch or chafe. Bull Dog Quality all through.

A DRIDEK Top on a new car indicates the desire of the manufacturer to equip his car with the best the market affords.

*If you don't know all about DRIDEK send for samples and price list to Dept. C at once.*

**L. J. MUTTY CO.,  
Boston, Mass., U.S.A.**





**T**HERE'S really only a small difference in price between a good, dependable wrench and a poor one.

But what a difference stands out when the wrench is up against a real job!

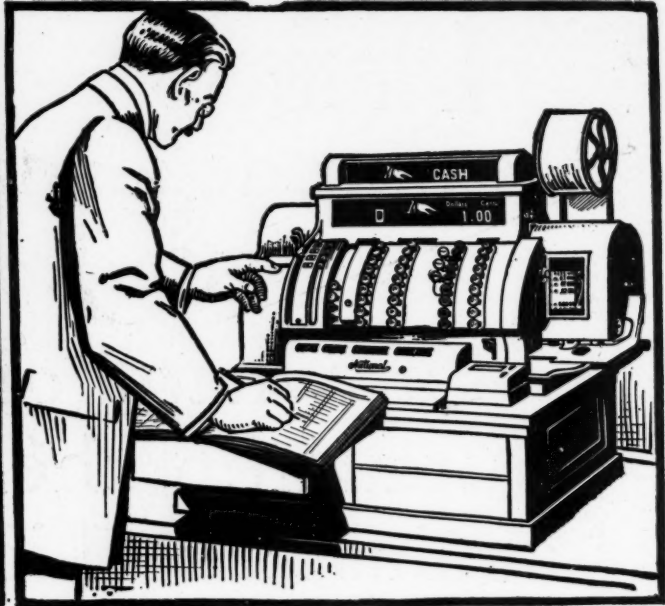
Cheap junk is often momentarily profitable to the seller, but real profit is based on a pleased customer.

B. & S. tools are world known. The Triangle B trade mark means "Rely on me." The man who owns a Billings wrench or tool knows that there is none better. He proves it—every time he needs real tool service.

If a tool goes wrong, you can easily ascertain the value of our guarantee.



Without a National Cash Register



With an up-to-date National Cash Register

## A man should not do the work a machine will do for him

A National Cash Register does 15 necessary things in 3 seconds.

Without the register a man cannot do these things in half an hour.

With the register, even a new clerk can do them just by pressing the keys.

Our newest model makes the records which a merchant needs to control his business.

Our new electric machines are as much better than old machines as an up-to-date harvester is ahead of a sickle for cutting grain.

The latest model National Cash Register is a great help to merchants and clerks.

It pays for itself out of what it saves.

### Merchants need National Cash Registers now more than ever before

----- FILL OUT THE COUPON AND MAIL TODAY -----

Dept. 605 The National Cash Register Company, Dayton, Ohio.

Please give me full particulars about the up-to-date N. C. R. System for my kind of business.

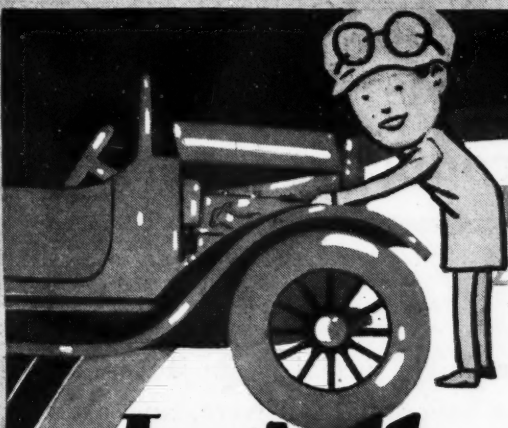
Name \_\_\_\_\_

Business \_\_\_\_\_

Address \_\_\_\_\_

When Writing to Advertisers, Please Mention Motor Age.





# Install

# MUNGER

## "Always Tight" Piston Rings

And make your engine the perfect power plant it was intended to be. Within thirty minutes after you start running with these rings, troubles and waste that seemed incurable will disappear forever.

You will see the difference IMMEDIATELY. We are so sure of this that we give a signed guarantee with each complete outfit, which says: "If these rings do not give you entire satisfaction, return them within thirty days to the dealer from whom you bought them, and he will give you your money back."

The wonderful Munger "Always Tight" Expansion Joint, so simple yet so efficient—the patent process of peening, which makes these rings fit the walls of any cylinder—and a minute oil grooves which seat these rings almost instantly—are distinctive features that make Munger "Always Tight" Piston Rings far superior to all others.

**SPLITDORF ELECTRICAL CO.,**  
**Sumter Division, 1466 Michigan Ave., Chicago.**  
 Atlanta, 10-12 E. Harris St.  
 Boston, 68 Brookline Ave.  
 Chicago, 2613 S. Michigan Ave.  
 Dallas, 402 S. Ervay St.  
 Detroit, 1295 Woodward Ave.  
 Kansas City, 1827 Grand Ave.  
 Los Angeles, 1215 S. Hope St.

**Newark, N. J.**  
**Service Stations:**  
 816 Hennepin Ave.  
 278 Halsey St.  
 7 W. 61st St.  
 210 N. 13th St.  
 5943 Ellsworth Ave.  
 1022 Geary St.  
 1628 Broadway  
 469 Yonge St.

# 30 minutes later

Give more power  
 Save gasoline  
 Save oil  
 Stop plugs fouling  
 Stop engine smoking



## Dr. Acheson Has Discovered a Way to Manufacture 99.9% Pure Graphite. Combines This with a Wonderful Grease, Thus Producing Gredag

---

When Dr. E. G. Acheson, 12 years ago announced that he had invented a method of manufacturing graphite he was greeted with about the same amazement that would result if someone were to manufacture iron or coal or diamonds.

Graphite was then, and some of it still is, mined. Mined graphite is impure. Contains all the way from 3½ to 18% of pulverized rock (certainly not helpful to bearings and gears) or other impurities.

What Dr. Acheson sought was **Pure** graphite, and his experiments were conducted with an electric furnace. All sorts of raw materials were tried out, one after another, and finally persistence won. Success crowned his efforts.

He opened his furnace, which for ten hours had been heated to 7,500 degrees—and found in it Graphite—99.9 per cent Pure Graphite. The one-tenth of one per cent impurity proved to be only condensed gas absorbed in the cooling process.

Next Dr. Acheson set about developing a grease. Before long he had perfected a grease which was almost as astonishing as his graphite.

He took the best neutral oils. He added the best non-edible fats. Then he cooked the grease over a slow fire 8 to 10 hours, stirring constantly.

This requires special steam jacketed kettles, for most other greases were, and are today, cooked over a hot coal fire. They often scorch or burn—and burnt grease corrodes and pits bearings.

Dr. Acheson's formulas produce greases always of the same consistency. He has eliminated all guess work from grease making.

The final result is a grease that melts only at extremely high temperatures. The cup grease, for example, melts only at 205 to 212 degrees while other greases break down completely around 120 degrees. Imagine the difference if you can.

Now there is a giant factory in Niagara Falls producing Gredag, which is a combination of Acheson 99.9% pure graphite with Dr. Acheson's wonderful grease.

A strange fact: Gredag, owing to economies in manufacture, can actually be made to sell at as low a price as many yellow greases.

Would you like to make a multitude of friends and many hundreds of dollars in the next few years selling this remarkable product, Gredag? If so, better write today to the Lubricant Dept., Acheson Graphite Company, Niagara Falls, N. Y. Don't delay, lest the opportunity slip by.

---

### TRY THIS SIMPLE TEST

Heat an electric iron or any piece of metal with flat surface.

Place a piece of Gredag cup grease about the size of hickory nut on the hot metal. At the same time drop a similar quantity of any other grease on the metal nearby the Gredag.

This is the "breaking down" test. Watch closely. See which melts, losing its lubricating qualities, first.

You will marvel at the way in which Gredag ignores the heat.

---





## The worst month in the year for automobile accidents

*Brakes are worn down after a summer's use and need attention*

**S**EPTEMBER is the worst month in the year for automobile accidents, according to records kept by police departments and safety societies. Here is the reason:

The cars have been used all summer—the brakes are worn down. Then, when the emergency comes, the brakes fail.

Your customers cannot afford to tolerate poor brakes. The protection of their cars and their own safety depend on the brakes being efficient. Their cars will be in service at least two or three months longer. In some cases they will be used right through the winter.

### Your customers should have their brakes inspected regularly

Point out to your customers why there are so many accidents in September. Urge them to have their brakes inspected at regular intervals.

When their brakes need relining, put on Thermoid, the brake lining that is made for long, certain service.

### Three reasons why thermoid satisfies your customers

1st—Over 40% more material and 60%

more labor is used in the manufacture of Thermoid than in any woven brake lining. This gives longest service.

2nd—Thermoid is the one brake lining that is Grap-nalized. This exclusive process resists moisture, oil and gasoline.

3rd—Thermoid is hydraulic compressed. It wears down slowly and can be used until cardboard thin.

Thermoid dealers are given the heartiest co-operation in building up a profitable volume of relining business. If you are not handling Thermoid, write today for information about the assistance which we give our dealers.

Every foot of Thermoid Hydraulic Compressed Brake Lining is backed by *Our Guarantee: Thermoid will make good—or WE WILL.*

At speed of	A car should stop in
10 miles per hr.	9.2 ft.
15 " " "	20.8 "
20 " " "	37 "
25 " " "	58 "
30 " " "	83.3 "
35 " " "	104 "
40 " " "	148 "
50 " " "	231 "

Will your car do this?

### Thermoid Rubber Company

Factory and Main Offices: Trenton, N. J.

Factory Branches

New York, Chicago, San Francisco, Detroit, Los Angeles, Philadelphia, Pittsburgh, Boston, London, Paris, Turin.

Canadian Distributors

Canadian Fairbanks-Morse Co., Limited

MONTREAL

Branches in all principal Canadian cities



Makers of "Thermoid Crolide Compound Casings" and "Thermoid Hardy Universal Joints"

# What you can next Liberty Loan

## *Read this carefully—then ACT*

**T**HE three Liberty Loan issues already successfully floated have been put over by the win-the-war spirit of the American people.

In connection with the great work of awakening and quickening to action the spirit of war sacrifice which has been the greatest factor in the success of Liberty Loans it would be impossible to put too high a valuation on the splendid voluntary work of American business men, bankers, labor leaders, and moulders of thought in all professions and occupations.

The very success of this volunteer leadership in creating enthusiasm has shown the desirability of organized methods for increasing its usefulness. And particularly to suggest to those leaders who feel that their circle of action is relatively small the enormous amount of good they can do as a whole *if each no matter how small or great (relatively) his sphere may be, will act with enthusiasm and system.* The great factory or store, society or club, church, or other organization with, say 5000 employees, members, or audience, does a great work in "selling" the Liberty Loan idea to such an aggregation. But that work is fully matched in aggregate importance by a hundred such institutions whose average payroll, membership, or audience, comprises only fifty persons each.

The nation has much other work to do. The Liberty Loan drives are necessarily carried through largely by volunteer work. In consequence they must be limited to specific brief periods for the actual subscription to the bonds.

**T**HESE brief sharp campaigns have the advantage of building up white-hot waves of enthusiasm, but it is extremely difficult in such periods to secure close contact with *all* the wage-earning and money-making units of the public and

especially to bring home personally to each individual the important serious personal relation which he or she should have to the war and to the successful financing of it.

To the accomplishment of that great end it is now proposed that the leaders of thought and action in America and especially the *employers of labor*, great and small, whether in store or factory, whether engaged in production or distribution,

**hold a meeting of your employees shortly previous to the Fourth Loan campaign, not to take bond subscriptions but to arouse serious enthusiasm for the forthcoming Loan.**

**W**HERE organizations are small, as for example small stores, similar organizations in the same or related lines of business can be invited to participate in one meeting. As for example, all the grocers in a small city, or all those in a given section in a large city, might get together in one meeting. But it would be a grocers' meeting. In such cases it would usually be wise to keep related trades together.

Whether the audience be great or small, every effort should be made to "stage" the meetings effectively, to make them interesting and instructive and above all to give *employees themselves* an opportunity to speak, to discuss, to suggest, to enthuse their fellow employees.

**"Win-the-War" Meetings need not be limited to gatherings of employees. They can be equally effective if organized as "town meetings"—or by clubs, societies, churches, lodges or similar institutions. Leadership, organization, and a definite program will work wonders.**



# do NOW to help the

It is not essential that such meetings be *called* Liberty Loan meetings—they would better be announced as “Win-the-War” meetings, and above all it should be made clear that no attempt will be made at these meetings to secure or accept subscriptions for Bonds or money for any purpose whatever—but in all the speaking and discussion attention should be largely devoted to the forthcoming Loan.

The Fourth Liberty Loan Campaign will begin on September 28th.

All of the preliminary meetings should be held not earlier than September 10th and not later than September 25th, unless there are special circumstances which would make an earlier or later meeting expedient.

**T**HE LIBERTY LOAN BUREAU has prepared a booklet setting forth “Suggested Programs for Meetings to Prepare for the Fourth Liberty Loan.”

They have asked us as publishers of a business paper to bring this suggestion for patriotic service to the attention of our readers and to urge its hearty adoption by all stores, factories, employers of labor in any capacity, societies, clubs or organizations of any kind who can arrange such meetings.

We have been furnished with copies of the booklet giving “Programs for ‘Win-the-War’ Meetings”—and will send a copy promptly to anyone signing the

coupon below and mailing it to us. The signing of the coupon is your pledge to hold such a meeting either of your employees or of some similar group which you can bring together previous to the Fourth Liberty Loan Campaign and your pledge when received will be turned over to the Liberty Loan Bureau and officially acknowledged.

Such meetings organized in the “Win-the-War” spirit will not only help tremendously to insure 100 per cent subscriptions to the Fourth Liberty Loan among employees of industrial and commercial concerns, they will do more than almost any other one thing could do to develop among all ranks of the public the stern spirit of sacrifice and the necessity for loyal, constant, steady service of each and every one in the great national work of victory for the cause of Liberty and Democracy.

They will serve to educate and make clear to all the vitally important way in which work and sacrifice here in our midst help and sustain the work of our fighting men “over there.”

This is an opportunity for every American business man to do a great and helpful work for the Fourth Liberty Loan and one which will help win the war.

There is plenty of time for efficient action. There is no time to lose in preparing for that action.

## MOTOR AGE

**Sign the Coupon  
Mail it to**

**MOTOR AGE**

Mallers Building, Chicago, Ill.

**Get the Book  
Hold Your Meeting  
and  
make it a  
“hummer”**

This space contributed to the winning of the war  
by Motor Age.

I pledge myself to organize and hold a “Win-the-War” meeting previous to the opening of the Fourth Liberty Loan Campaign in order to help float the Loan.

Send me † copy of Liberty Loan Committee Booklet giving suggestions for Programs for such meetings.

Signature .....

Position or Title .....

\*Firm .....

Street No. ....

City .....

State .....

Date .....

\* If a Society, Club or similar organization give name here.

† If more than one copy is desired state number.

When Writing to Advertisers, Please Mention Motor Age.

# SAVES MOTOR ENERGY

A hot motor means—

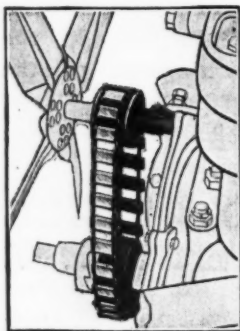
- less power.
- less oil mileage.
- an increase in upkeep.
- and many other preventable ills.

Try a

## CROWE MECHANICAL FAN BELT

—it will keep your engine COOL.

It is a flexible steel chain belt, with leather friction surface. It will not slip, stretch or break. Its positive grip drives your fan at full speed until you stop the engine. It is water, dirt, oil and grease proof.



### A 15,000 MILE GUARANTEE

is your assurance of a cool engine when you use the CROWE Fan Belt. Easily and quickly installed. Made in many sizes (both flat and "V" type) for passenger cars, trucks and tractors.

If your dealer cannot supply you, write us direct. Sent direct, prepaid, where we have no dealers. Standard Ford size, \$1.25 (Canada \$1.50). Other sizes priced on request.

### MECHANICAL BELT COMPANY

1207 Fredrick Avenue, St. Joseph, Mo., U. S. A.

If you drive a Ford, you need a **SWAN FAN BELT ADJUSTER**. Automatically regulates the tension of ANY Ford fan belt. Guaranteed for the life of your car. Price 35c (Canada 50c).

## CROWE MECHANICAL FAN BELT



### One of America's Great Trucks

Strength and ruggedness for city and inter-city hauling—an abundance of power for any emergency—dependability that keeps it a stranger to repair shops. These are the built-in qualities of

## ONEIDA TRUCKS

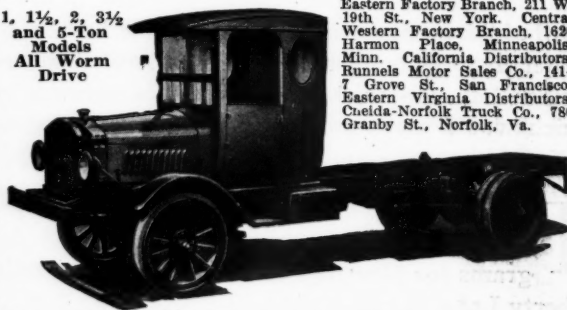
They are qualities which rank it as one of the great trucks of America.

DEALERS: Write or wire  
Your territory may still be open

PROMPT DELIVERIES

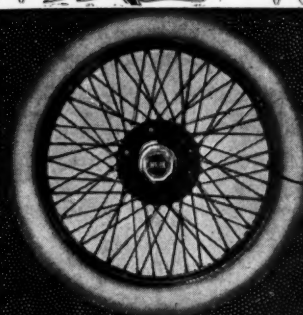
ONEIDA MOTOR TRUCK COMPANY  
Dept. 419, GREEN BAY, WISCONSIN

1. 1½, 2, 3½  
and 5-Ton  
Models  
All Worm  
Drive

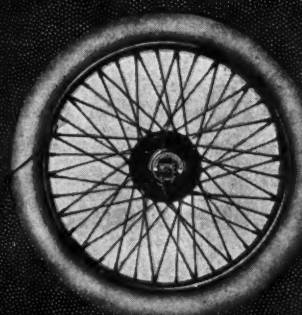


Eastern Factory Branch, 211 W. 19th St., New York. Central Western Factory Branch, 1626 Harmon Place, Minneapolis, Minn. California Distributors, Runnels Motor Sales Co., 141-7 Grove St., San Francisco. Eastern Virginia Distributors, Oneida-Norfolk Truck Co., 786 Granby St., Norfolk, Va.

## WIRE WHEELS



for 150 makes of cars.  
Write for full information  
and prices on wire wheels  
for any make or model of  
car.



List price for set of 5 wire wheels, 4 inner hubs, 4 hub caps, hub cap wrench, spoke nipple wrench, 1 hub dust cover for spare wheel. \$85. White, black, red. Color optional.

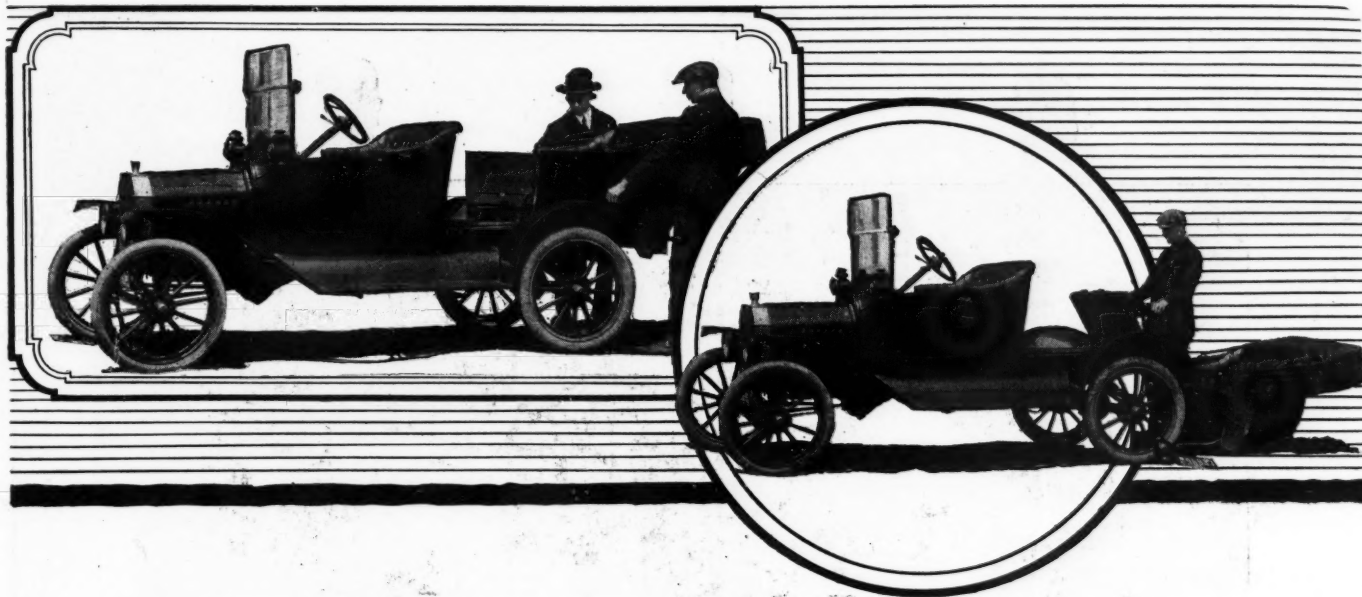
### DEALERS!

Wire Wheels are sellers! Get particulars of wire wheel service and sales agent's propositions.

Ford distributors and accessory dealers should write for service and sales proposition for HOUSE Wire Wheels for Ford cars.

Wire Wheel Corporation of America  
Successors to Houk Mfg. Co.  
835 Eleventh Ave. at 57th St. New York





## Take Up the Slack of Your Motor Car Shortage

Every week we are closing up more and more of the very best motor dealers on selling rights for Heath DUPLEX folding delivery body.

They have been quick to recognize the immediate and immense market for Heath DUPLEX among the 2,000,000 and more Ford owners.

They have also realized that the Heath DUPLEX is a permanent, profitable selling proposition to make up for the present motor car shortage.

The Heath DUPLEX does the work of two cars at the cost of one Ford. It changes a Ford touring car to a truck in 60 seconds. It restores the Ford tonneau to its original passenger use and appearance in equal time.

The Heath DUPLEX delivery body eliminates the necessity of owning separate cars for delivery and passenger purposes. It puts an end to the abuse of carrying goods in the tonneau.

One demonstration will prove the Heath DUPLEX as a practical, profitable investment.

Because it makes the Ford doubly essential, it is almost a patriotic necessity to the Ford owner.

That is why so many of the largest motor car dealers have seized upon the Heath DUPLEX

as a timely resource to protect their business against the shortage in motor cars. That is why they have utilized the Heath DUPLEX as a means of increasing the volume of their wartime business.

There are still a few openings for territory allotments. Write us at once and we will advise you if there is an opportunity for you to acquire selling rights of the Heath DUPLEX.

### What Heath DUPLEX Is and Does

The Heath DUPLEX is a patented folding delivery body 4 feet 4½ inches long, 32 inches wide and ten inches deep, and two angle iron supports permanently fitted to the Ford chassis.

After the Heath DUPLEX is attached, the body of the Ford touring car is replaced on the Ford chassis, just as it was, except that the tonneau is made removable.

Simply slide off the Ford tonneau, unfold the Heath DUPLEX, and you have a business car. No tools are required.

Fold up the Heath DUPLEX, slide the Ford tonneau over it, and the Ford is again a passenger car with no signs of its business utility.

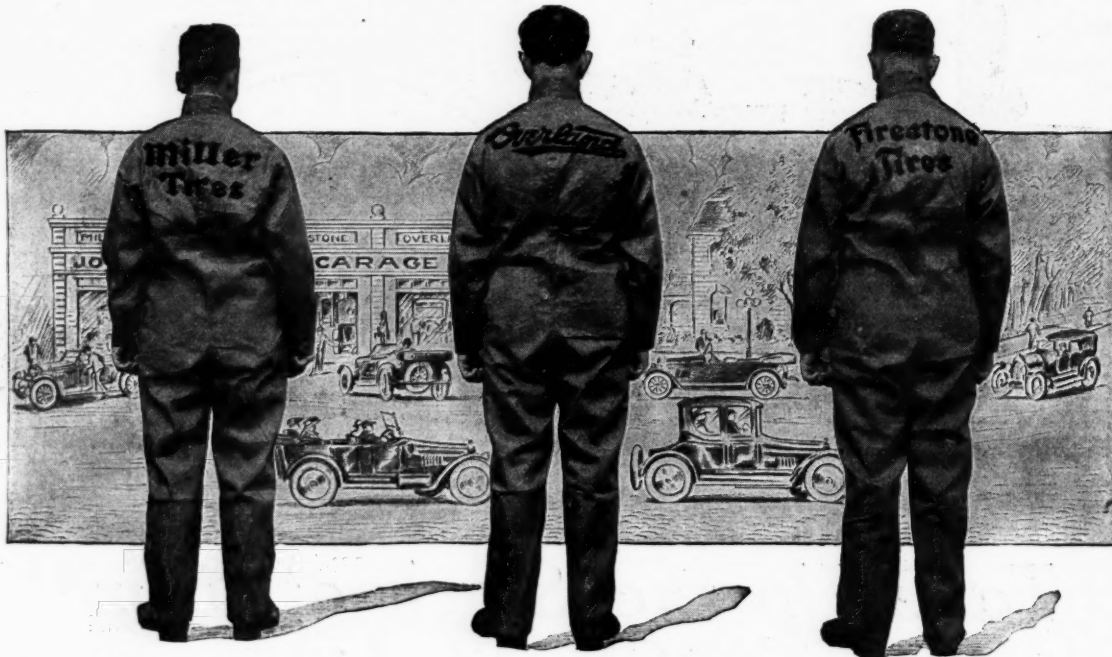
*Sixty Seconds* makes the change from passenger to truck or back again to passenger car.

**McCord Manufacturing Company**  
Division D  
Detroit, Mich.

**Heath**  
**Duplex** **\$57.50**  
F. O. B. Detroit

PATENTED MAY 12 1908, DEC 13 1916

When Writing to Advertisers, Please Mention Motor Age



## They Use the Best—PROTEXALL Garments

Whenever comparison is made only one choice will result—PROTEXALL OVERALL SUITS—the garments with the SPRING BACK which does not permit binding or pulling across the chest or back. PROTEXALL OVERALLS are made of the best government khaki, and their many distinct features make them the choice of discriminating buyers.

THE PROTEXALL COMPANY, Abingdon, Ill.



### The Curtis Sign

Illustrated above—is 10x14 inches—baked enamel on steel. Cannot be bought, but is furnished FREE with every CURTIS Garage Air Compressor—and cannot be had in any other way.

# Install a Curtis Air Compressor

Display a CURTIS "FREE AIR" SIGN above your door—it inspires confidence and will help build your business. Motorists are looking for this familiar CURTIS slogan—because they know oil rots tires—and that a CURTIS Air Compressor furnishes AIR FREE FROM OIL, which means fewer blowouts, greater tire mileage and less repairs. The CURTIS is the ONLY Garage Air Compressor with the controlled splash oiling system that eliminates all danger of forcing oil into the air line.

## CURTIS AIR FREE FROM OIL

Investigate the many exclusive features of CURTIS Garage Air Compressors. The line is complete—five sizes—stationary or portable. Just write your name and address on the margin of this advertisement—tear it out and send it to your jobber, or to us direct, for complete information and prices.

Curtis Pneumatic Machinery Co.

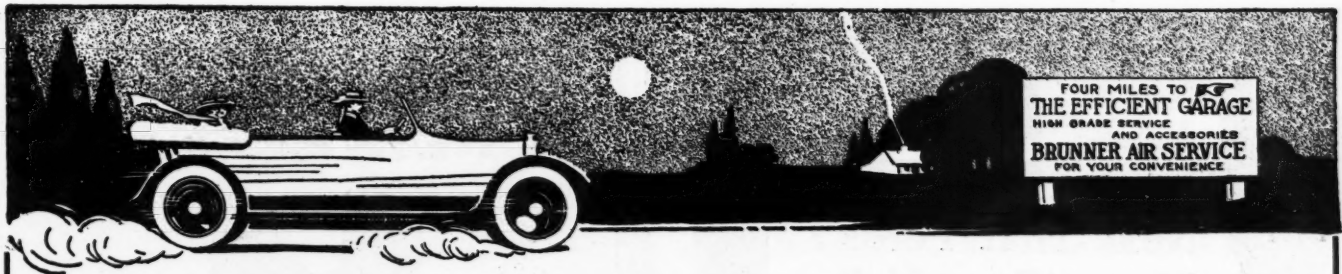
1527 Kienlen Ave., St. Louis, Mo.

Branch Office—530-H Hudson Terminal, New York City



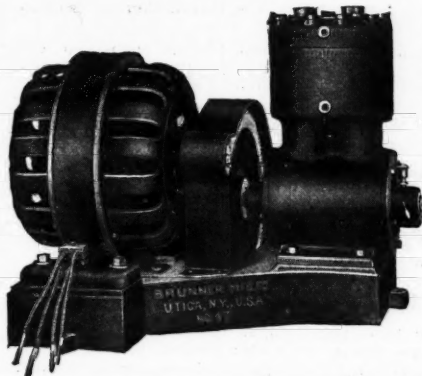
When Writing to Advertisers, Please Mention Motor Age





## IS YOUR AIR COMPRESSOR EFFICIENT?

Do you realize, Mr. Garageman, that your income is governed by the efficiency of your service more so now when labor is at a premium than in normal times? Well it is, and right now when efficiency means so much to every business man in the country you should put your compressed air service on a 100% efficiency basis.



## A BRUNNER AUTOMATIC AIR COMPRESSOR AND A BRUNNER AIR SERVICE SIGN

would save you time and labor because it automatically maintains a proper working pressure and needs no watching—and besides, the big red centre of the Brunner Sign is familiar to the Brunnerwise Motorist.

*No. 15 Catalogue and Name of Brunner Jobber on Request*

### BRUNNER MANUFACTURING COMPANY

Main Office and Plant  
UTICA, N. Y.

Cincinnati Branch  
CINCINNATI, OHIO

## THE SPECIFICATIONS OF

# LANE

## MOTOR TRUCKS

### TELL A BIG SUCCESSFUL SALES STORY TO DEALERS

Lane Trucks are supreme in their capacity class—They are rightly priced and built as a truck should be—to stand up under overload and rough handling. And, Lane Trucks are complete trucks to the most minor details.

#### EQUIPPED WITH ELECTRIC STARTING AND LIGHTING SYSTEMS STORM PROTECTING CABS WITH WINDSHIELDS AND CURTAINS

Lane Truck specifications prove their quality class. Continental Motors. Timken Rear Axles. Ross Steering Gear. Special Type Radiators. Positive water circulation. Roller Bearing, independent sliding gear transmission; four speeds—3 forward, 1 reverse. Drop forged I beam front axle. Extra heavy reinforced channel or pressed steel frames. Stromberg hot air jacketed intake carburetors. Two unit system generators and motors. Willard Storage Batteries. Raybestos lined, flexible, positive acting three plate disk clutch, etc., etc.

*Let us send you complete detailed specifications and sales plans for your territory.*

### Three Models

3,000 lbs.

5,000 lbs.

7,000 lbs.

Capacity

Worm Driven  
Trucks

The Lane Motor Truck Co. (Dept. J.) Kalamazoo, Mich., U. S. A.



## Now That Fords Have "Gone Up" in Price—

and with a possibility of further advance, there's more need than ever for DUPLEX Equipment

You pay more for a Ford today than you did a year ago. You may pay even more—if it is possible to obtain a car at all—a year from now. "Hedge"—protect your Ford with a

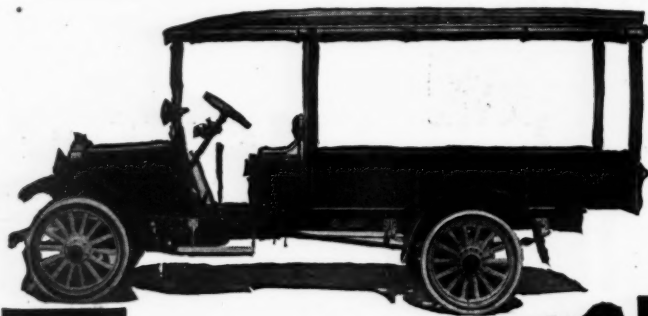
## DUPLEX Cantilever Spring System For Fords

Most scientifically right spring system ever devised for Ford use. Guards against jars and vibration. Relieves mechanism of road strain. Lengthens car's life amazingly. Saves big on repair bills. Puts off necessity of new car buying. Ready to install. Fully guaranteed.

### 30-DAY MONEY BACK TRIAL

Price per set of four only \$18. Order direct from ad or write for complete descriptive matter. Save your car—save cash—enjoy greater riding ease.

**DUPLEX CANTILEVER SPRING COMPANY**  
178 N. Dearborn Street CHICAGO, ILL.



# Commer

## A Year Ahead of Other Trucks

The only truck having everything  
necessary on it—when you buy it

Three types of bodies for all models—Bijur Starting and Lighting System, with Dixie Magneto Ignition—Stewart Vacuum System—Pierce Governor—Windshield—Bumper. Continental Motor (3 3/4 x 5)—Torbenson Rear Axle—Detroit Steel Products Company Springs.

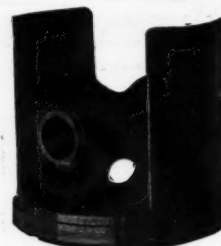
One Ton Chassis.....	\$1450.00
With Express Body.....	1515.00
With Post Top and Storm Curtains.....	1580.00
With Standard Stock Body.....	1605.00
Truck, including 3 Ton Trailer.....	2355.00

**THE COMMERCE MOTOR CAR COMPANY**  
DETROIT, MICH.

W. H. Brinkerhoff, Eastern Dist. Mgr.  
Belmont Ave., Elmhurst, Long Island, N. Y.

## AMPECO SUPER-PISTONS

ONE  
RING  
ONLY



NO  
DEAD  
WEIGHT

## Add Power and Economy To Ford Engines

Instantaneous results follow the installation of Ampeco Super Pistons in Ford engines.

The extra light weight Ampeco Pistons means no lost power in driving the piston. This, in turn, means increased power and decreased gasoline and oil consumption.

The extra light weight also greatly cuts down vibration in the engine. This means longer life for the engine and greater riding comfort.

Experience has shown a saving of 50% in oil and a saving of 25% to 50% in gasoline.

Ask your dealer for details.

DEALERS—Ampeco Super Pistons will be your best seller. A demonstration sells them. Write us for catalog and details.

**AMERICAN MACHINE PRODUCTS CO.,** Marshalltown, Iowa  
Exclusive Sales Agents **FULTON SALES COMPANY**  
624 South Michigan Avenue, Grant Park Building, Chicago, Illinois.

## Manufacturers Requiring Agents in Great Britain and Ireland

Are respectfully requested to send current quotations and supplies of catalogues for distribution

### Buying Agencies Required

References: Royal Bank of Ireland, Ltd., Dublin

#### SPECIALTIES

Hardware. Tools. Agricultural and  
Other Machinery. Motor Cars.  
Outboard Engines. Tractors.

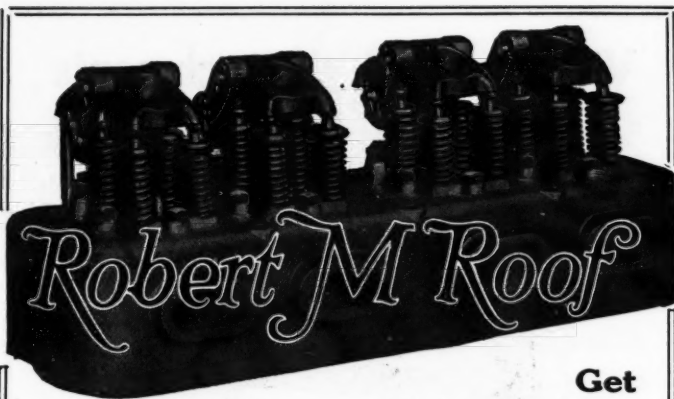
## The European Bureau of American Manufacturers

The European Headquarters for American  
Novelties, Specialties and Staple Articles

42 Westland Row Dublin, Ireland  
And at London, Liverpool, Manchester, Paris

Telegraphic Address: Codes:  
"Byrne 2311, Dublin" Western Union. A.B.C. 5th Edition. Lieber's





**Get  
75 to 80 Miles  
an Hour from Your Ford with These  
Peugeot Type Cylinder Heads**

Your Ford will ramble faster than you can drive it on the road—and it will step away ahead of ordinary Fords on the race course equipped with ROOF'S Peugeot-Type Cylinder Heads, and 3 to 1 gear ratio.

**16 OVERHEAD VALVES**

—almost double its valve area, and there is absolutely no back pressure in the exhaust outlet.

Special equipment complete for speedster, touring car and truck. Why not double the value of your truck? Easy to install. Set right in the place of the old cylinder head. Rocker arms operate from the regular cam shaft. Our liberal C. O. D. offer will interest you. Write for free literature and complete details. Sells every month in the year. Rush season now on. Dealers, Garage and Repairmen, write.

**Price \$100**

**LAUREL MOTORS CORPORATION**

Successors to ROOF AUTO SPECIALTY CO., Anderson, Ind

MADE IN THE PUNCTURE PROOF CITY

# "WHITNEY"

## Roller Chains


You can't go wrong by placing "Whitney" Chains on your truck or tractor. We've made chains for years and our growth and success indicate the excellence of our product.

**When Making Replacements  
Be Sure and Order "Whitney"**

Send for our pamphlet "O"—Care and Lubrication of Driving Chains. It will help reduce your maintenance cost.

Convenience    Strength    Durability  
Accuracy    Economy    Reputation

**THE WHITNEY MFG. CO., Hartford, Conn.**  
Chain    Keys and Cutters    Hand Milling Machines



**The Hollenden  
Cleveland**

*"Home of The Cleveland Auto Club"*

**Q**UIET elegance, dignity and refinement are expressed throughout in Hollenden appointments, and reflected in Hollenden patronage.

The Hollenden is known as Cleveland's most exclusive hotel.

**EUROPEAN PLAN — WITH BATH:**  
For One Person \$2 to \$5  
For Two Persons \$3 to \$6  
With Twin Beds \$4 to \$6  
Suites at Various Prices

Ample garage facilities immediately adjacent  
Official A. A. A. Hotel

THE MARK OF  
**QUALITY**



**HALLADAY**

**A Real  
Interchangeable  
BUMPER**



That fits practically all cars with extension frames

Attached without cutting, drilling or in any way altering the frame or aprons.  
The steel side arms have enormous strength against direct thrust and spring laterally relieving the frame from side blows.

**SOLD BY ALL LIVE DEALERS**

If your dealer does not carry them, write us.  
We will refer your inquiry to one who does.

**L. P. Halladay Company**    STREATOR, ILLINOIS

# RUSTICENE

Trade Mark Reg'd—Pat. Off. Wash.

## WILL LOOSEN IT

A few drops readily releases rusted bolts, nuts, pins, thumb-screws, spring clips, knuckles, shaft-bearing, turn-buckles, and all rusted parts.

Dissolves rust, verdigris, red or white lead, ammonia scale, paint, tar and grease.

Works in a few seconds.

Eliminates use of chisel, vise and blow-torch. A necessity in every line of machinery work. Used by Motorists, Railroads, Motor Cars and Tractor Companies, Ship-Yards, Contractors, Machine Shops, Garages, Farmers, Printers and by all leading industries.

Non-inflammable and practically inodorous. Entirely free from acids or alkali. Guaranteed harmless. Will not injure metal, rubber, wood, leather or fabrics.



Quickly loosens motor car tires which are set or rusted on rims. Removes road oil and tar from windshield and car body.

Use it once and you will never be without it.

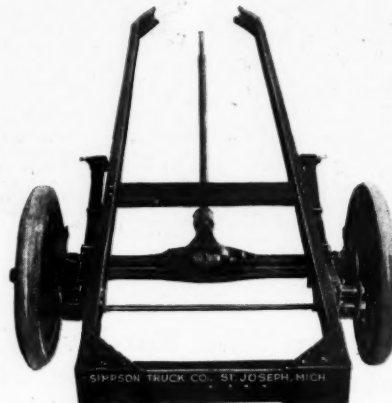
### PRICES:

1 Gallon...	\$6.00	1 Quart.....	\$2.00
1/2 Gallon...	3.25	1 Pint.....	1.25
		3 1/2 Ounces...	.60c

At your Accessory Dealer  
Hardware Store or

**GRAMOLINE COMPANY, Ltd.**  
9 S. LaSalle St., CHICAGO, U. S. A.

## Victor Truck Attachments



**F**ITS All Passenger Cars, Making a Strong Durable 1 or 2 Ton Truck, Using Clark Internal Gear Axles, Tuthill Springs, Acme Universal Joints and Propeller Shafts, Artillery Type Wheels, Solid or Pneumatic Tires "as specified," 5" Channell Steel Frame. "SAVE MONEY." The Upkeep is included in the first cost.

**1-Ton, \$425.00**

**2-Ton, \$525.00**

**MR. DEALER:—Let us mail  
you our Attractive Proposition.**

**SIMPSON TRUCK COMPANY**

Dept. K  
ST. JOSEPH, MICHIGAN

**FAFNIR**

**BALL BEARINGS**

**THE FAFNIR BEARING COMPANY**

Conrad Patent Licensee  
Main Office and Factory: New Britain, Conn.  
Detroit Office: 752 David Whitney Bldg.  
Chicago Office: 190 So. Michigan Ave.

## May we send you this guide of Buffalo and Niagara Falls?

**A**N illustrated guide to points of interest in and around Buffalo and Niagara Falls. Free on request.

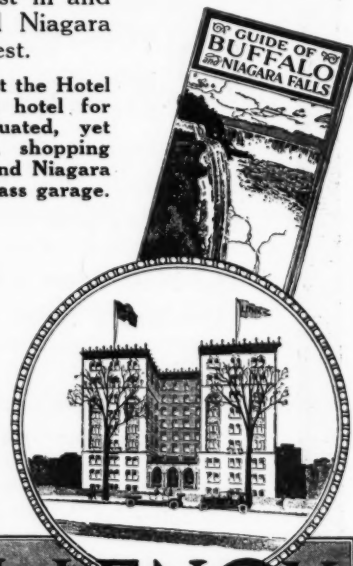
When in Buffalo, stop at the Hotel Lenox—Buffalo's ideal hotel for motorists. Quietly situated, yet convenient to theater, shopping and business districts and Niagara Falls Boulevard. First-class garage.

European plan. Fire-proof, modern. Unusual cuisine. Every room an outside room.

\$2.00 per day up.

On Empire Tours, Road map and running directions free on request.

**C. A. MINER**  
Managing Director  
North St. at Delaware Av.  
BUFFALO, N. Y.

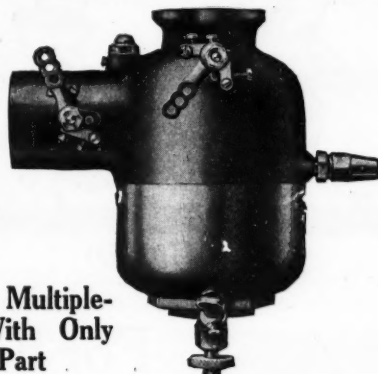


# HOTEL LENOX



# KNOX CARBURETOR

**GUARANTEE.** Regardless of price or type we guarantee that our Model "F" Gasoline Carburetor will save you from 10% to 30% in fuel consumption and a proportionate increase in power and flexibility over any other carburetor now on the market. **30-DAYS' TRIAL.** Attach one of our Model "F" carburetors to your motor and if you are not absolutely satisfied that it accomplishes all we guarantee, your money will be refunded on return of the carburetor, charges prepaid, within 30 days after your purchase.



## A True Automatic Multiple-Jet Carburetor With Only One Moving Part

**AUTOMATIC ACTION.** Gas and air automatically taken care of by floating atomizing valve.

**ECONOMY.** Atomizing valve operates in unison with motor speed; automatically handles fuel as it passes up by metering needle. It is fitted with twenty independent jets. Perfect vaporization is automatically accomplished as these jets are swept by Full Volume of Air rushing through carburetor. Back flow of fuel passes into bowl carburetor for further use.

**POWER.** Extreme power is assured by the absence of Internal Resistance.

**SIMPLICITY.** Only one moving part. When once properly adjusted it is always adjusted, and should be let alone.

**WEATHER OR MOTOR CONDITIONS.** A uniform mixture is maintained throughout the entire range of speed and load. It is NOT affected by weather or altitude changes.

**CAMDEN ANCHOR-ROCKLAND MACHINE CO.**

Manufacturers of  
KNOX MOTORS, Carburetors, Launches

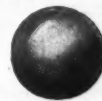
### PRICES

For 1-in. Intake  
Pipe, \$18.00;  
1 1/4-in. \$20.00;  
1 1/2-in. \$23.00;  
2-in. \$33.00.

Special Manifold  
for Fords

CAMDEN, ME.

**HOOVER**  
STEEL BALLS



## Gain World Supremacy

FOR many years the United States was dependent upon Germany for its supply of high-grade steel balls.

That day has passed, never to return.

The Hoover Steel Ball, developed, perfected and produced in ample quantities to supply the requirements of America and Allies, is the superior of any steel ball ever previously manufactured in Germany, or anywhere else.

A complimentary copy of "The Evolution of the Steel Ball Industry" awaits your name and address

**HOOVER STEEL BALL CO.**

Ann Arbor, Michigan, U. S. A.

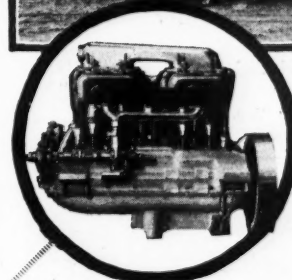
## Are You Wise?

Do you know the detailed specifications of all passenger cars and motor trucks? Do you know the sizes and prices of all tires and tubes sold on the American market? Do you know the size and style of all electric bulb equipment for all passenger cars?

Every first of the month issue of Motor World presents the correct detailed specifications as above indicated. They are invaluable to men in the trade. Motor World is designed and edited for dealers, jobbers and garage owners exclusively. Published weekly. Fifty-two special and regular issues for two dollars per year. A big value—and getting bigger. Send your subscription to

**MOTOR WORLD**

239 West 39th Street, New York City



Four and Six-cylinder  
(all four-cycle) for  
Trucks, Tractors and  
Commercial Work.  
Write for Specifications  
of Types and Sizes.

## Under the Stress of War Duty

real efficiency is brought to light. Equipment that fulfills war's demands meets every commercial requirement. The army recently contracted for many thousands of F. W. D. Trucks, equipped with

**Wisconsin**  
CONSISTENT  
**Motors**

This signifies Government approval of Wisconsin Motors' continuous, consistent, dependable power. Of proven mastery over every power contingency. The arguments that clinch truck and tractor sales

**WISCONSIN MOTOR MFG. COMPANY**

Sta. A., Dept. 311, Milwaukee, Wis., U. S. A.  
New York Branch: 21 Park Row, T. M. Fenner, Factory Rep. Pacific Coast  
Distributor: Earl P. Cooper Co., 1310 S. Los Angeles St., Los Angeles, Cal.

# PUT IT THERE!



## There's More Mileage In Every Ford Owner's Foot

Here's where "head-work" combined with "foot-work" results in more pep in car performance, greater driving convenience, increased mileage and a third off your gasoline bill.

## The REMINGTON GASOLINE SYSTEM FOR YOUR FORD

saves gasoline, gives more power, provides a foot accelerator, insures perfect control and gives you greater ease of operation. The heated air supplied by The Remington Gasoline System thoroughly mixes with the gasoline vapor and does not cause condensation.

Quickly and easily installed without cutting the floor board, drilling or tapping. Sold for \$10.00 complete, with a 30 day money back guarantee. Send for circular.

**The Remington Mfg. Co.**

1142 Real Estate Trust Building, Philadelphia  
Chicago Office: 62 East Lake Street

"Defies Time and the Elements"



**CHASE  
DREDNAUT  
Motor  
Topping**

More "Chase" material  
is used on vehicles today  
than any other brand

**L. C. CHASE & CO., BOSTON**  
NEW YORK DETROIT CHICAGO

Seventy Years' Leadership in  
Manufacturing



NEW YORK, CHICAGO, DETROIT, SAN FRANCISCO  
WORKS AND FOUNDRIES: SPRINGFIELD, MASS.



## Protects your automo- bile from damage.

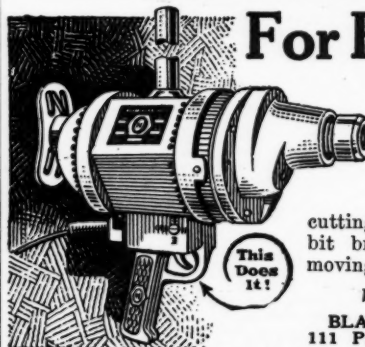
Protects it from strain  
and you from disagree-  
able bumps. The

**Hartford**  
**BUMP ABSORBER**  
— more than a Bumper

is deservedly known as  
"The National Guard  
for Motor Cars"

Edward V. Hartford, Inc.  
146 Morgan Street  
JERSEY CITY, N. J.

"ON GUARD!"



## For Fast Work

This drill makes possible  
fast, accurate work with  
inexperienced workmen.

The Pistol Grip and  
Trigger Switch gives a  
firm hold and allows  
cutting off the current when the  
bit breaks through without re-  
moving either hand from the drill.

Write for full particulars

**BLACK & DECKER MFG. CO.**  
111 Pratt St. Baltimore, Md.

## B & D Portable Electric Drill

"With the Pistol Grip and the Trigger Switch"

## Use Headlights That Identify Your Car

New and distinctive types  
of electric headlights for all  
cars.

Lights that identify  
your car. Built by the  
largest manufacturer  
of automobile lamps.

**The John W. Brown Mfg. Co.**

Columbus, Ohio  
Detroit Offices: 411 Union Trust Bldg.



## ANDERSON AUTOREELITE

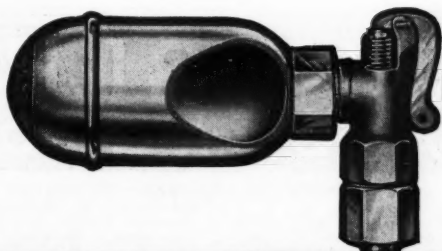
MAKES TIRE CHANGING AS EASY BY  
NIGHT AS BY DAY

More than just  
a Spotlight.



**ANDERSON ELECTRIC SPECIALTY CO.**  
118-124 S. Clinton St. Chicago, Ill.





## INSTANTANEOUS!

One blast from this wonderful whistle compels instant attention—gives lightning warning of danger. The

## BUELL EXPLOSION WHISTLE

operates with the full explosion pressure of the engine, never gets out of order, never requires attention and is guaranteed for 10 years. Already standard or optional equipment on 35 motor cars and trucks. Single tone and chime.

*Write for descriptive circular*

**BUELL MANUFACTURING CO.**

2977-79 Cottage Grove Ave., CHICAGO

DEALERS—Stock the Buell. It is the quickest selling accessory on the market.



## More Comfort—Less Gasoline

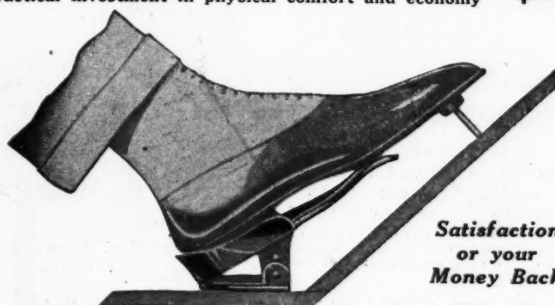
Why suffer from cramped, tired, aching legs on long runs? You can enjoy perfect comfort, get more pleasure out of driving, and feel fitter when the trip is over by using

## The Comfort Foot Rest

Perfectly balanced and automatically adjustable to your foot. Eliminates the constant lunges on the accelerator when traversing rough roads. Lessens work of motor, prevents carburetor from flooding, and stops waste of gasoline.

Handsomely nickered, durable, inexpensive. A really practical investment in physical comfort and economy

**\$2**



*Satisfaction  
or your  
Money Back*

**THE GENERAL APPLIANCE CO.**

103 Boylston Street

BOSTON, MASS.

## A WINDSHIELD WIPER THAT WORKS!

# SEE-SAFE

### WINDSHIELD WIPER

An efficient, strongly built, strictly high class windshield wiper that **really works**—not once in a while but **all** the time. There is not a better wiper at any price. Here you get a \$1.50 value for 50c.

The new, improved squeegee tubing permits two wiping surfaces in contact with the glass. The wiper is held firmly in position and cannot slip. The squeegee cleans the glass thoroughly.

The extremely low price is made possible only by the simplicity of construction.

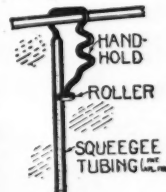
**50c AS LONG AS OUR  
PRESENT SUPPLY  
OF 20,000 LASTS**

We have on hand a lot of 20,000 that will be closed out at the unprecedented price of 50c. These were made from material bought before the days of curtailment. This lot probably won't last long. Car Users—Send us 50c with your dealer's name for wiper shipped postpaid.

### DEALERS!

At this price the See-Safe is a whirlwind seller. The counter display box in which each dozen are packed make the See-Safe a self-salesman. Just display See-Safes and you will sell them. Send your order with your jobber's name, to-day!

**STADEKER METAL SPECIALTY CO.**  
358 West Madison Street CHICAGO, U. S. A.



## OSCILLATING-ROTATING

# ECLIPSE

## VALVE GRINDER



**THE Eclipse** is an electrically driven valve grinder with the now famous ballistic movement—an exclusive feature found only in the Eclipse. This ballistic movement imparts a creeping, rotary motion to the grinding stem which combines with the oscillating strokes to give a perfectly smooth and true seat for the valve.

Efficiency, small cost and low operating expense are Eclipse features. An ordinary light socket supplies sufficient power. The motor operates on either direct or alternating current.

Can be used on all cars. (Special attachment for grinding the rear valve on Fords.)

The Eclipse has been used successfully for two years throughout the automotive industry.

*Write for literature, prices and discounts*

**Eclipse Valve Grinder Co.**  
1230 Lydia Ave., Kansas City, Mo.

## PROTECT YOUR CAR

with



"Jasco" tanks are made of the finest steel, seamless tinned and tested—they carry your "gas" safely—being absolutely leakless and can withstand the severest knocks.

Send for descriptive literature

**JANNEY, STEINMETZ & COMPANY**  
Main Office, Philadelphia  
New York Office, Hudson Terminal Building

## SCHEBLER CARBURETOR

AT ANY OF THE FOLLOWING BRANCHES OR SERVICE STATIONS  
Elyea-Austell Co., Atlanta, Ga.; W. J. Connell Co., Boston, Mass.; The Wheeler-Schebler Carburetor Co., 2021 Michigan Ave., Chicago, Ill.; Pennsylvania Rubber & Supply Co., Cleveland, Columbus, Akron, Ohio; Ferris-Dunlap Auto Supply Co., Dallas, Texas; The Auto Equipment Co., Denver, Colo.; Herring Motor Co., Des Moines, Ia.; The Wheeler-Schebler Carburetor Co., 876 Woodward Ave., Detroit, Mich.; The Equipment Co., Kansas City, Mo.; Reinhard Bros. Co., Minneapolis, Minn.; Interstate Electric Co., New Orleans, La.; James C. Nichols, Inc., New York City, N. Y.; Manufacturers' Supplies Co., Philadelphia, Pa.; The Automobile Accessories Co., Pittsburgh, Pa.; Bailou & Wright, Portland, Ore., and Seattle, Wash.; Fred Campbell Auto Supply Co., St. Louis, Mo.; Weinstock-Nichols Co., San Francisco, Los Angeles, Oakland, Calif.; Canadian Fairbanks-Morse Co. All Principal Canadian Cities.

**THE WHEELER-SCHEBLER CARBURETOR Co. Inc.**  
INDIANAPOLIS · INDIANA

### Speed      Strength      Endurance

ROGERS ALL-STEEL TRAILERS, in all models, styles and sizes (½-ton to 10-ton capacity). Dumping Trailers, 4-wheel and 2-wheel Trailers, Semi-Trailers, highest quality, easiest running, longest lasting.

Write for Catalog and Price List

**ROGERS BROTHERS COMPANY**      Albion, Pa.



**YOU** get out of a bearing only what you put into it. We put in the best and most expensive bearing material known—chrome alloy steel.

## New Departure Ball Bearings



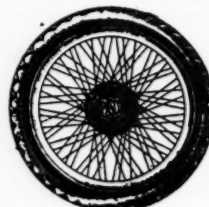
## AUBURN SIX

### Military Models

The new straight-line bodies are the most stylish cars under \$3000. Two 1919 models for 4 and 5 passengers.

**\$1595**      f. o. b. Auburn, Ind.

**AUBURN AUTOMOBILE COMPANY, AUBURN, IND.**



## PASCO WIRE WHEELS

Three exclusive patented features giving—

1. A stronger web with more crossed spokes.
2. A more dependable Hub Cap—impossible to strain or break.
3. A Safety Locking Device giving greater safety.

Pasco Wire Wheels—mean strength, safety, economy and distinctive beauty.

To dealers they offer an unusual opportunity for profits. Write for proposition.

**NATIONAL WIRE WHEEL WORKS, Inc.**  
GENEVA, N. Y., U. S. A.



*"Put the Blame  
on the  
Man Behind"*

### Comer Auto Stop Signal

An automatic safety device that operates off the brake rod. If your Dealer does not handle, send in his name or order direct. Retail Price \$12.50.

Dealers, write for special proposition.

**The Wonder Sales Co.,**  
616-617 Hippodrome Building  
CLEVELAND OHIO



## Igneto Coil File

Every spark plug user needs an "Igneto." Its smooth, fine cut teeth square the surface of the point clean. Mounted 12 on card. Stevens new catalog is a guide to safe staple buying. Get your copy.



*The Stevens Mark Always  
Guarantees Good Staples*

**STEVENS & COMPANY, 375 Broadway, New York**

**STEVENS PRODUCTS**



# STORM

MOTOR REPAIR EQUIPMENT

Is indispensable for speed, accuracy and efficiency. They will make money for you.

Write for COMPLETE Catalog covering

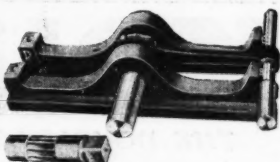
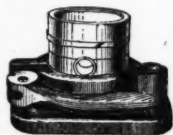
Cylinder Boring Machines,  
Connecting Rod Bearing Reamer, Jig and  
Straightening Gauge,  
Piston Vise, Valve Renewing Tools,  
Light Weight Pistons, etc.

For Sale by Leading Jobbers Everywhere

**STORM MFG. CO.**

Box 226

THOMPSON, IOWA



## Delivery Problems Are Solved by *Standard* WORM DRIVE TRUCKS



2,  
3½  
and  
5  
TON

Prompt deliveries of all capacities. Quality, price and demand insure good business. Write for our proposition.

GOOD TERRITORY OPEN

STANDARD MOTOR TRUCK CO., Detroit, Michigan

# Elgin Six

"Car of the Hour"

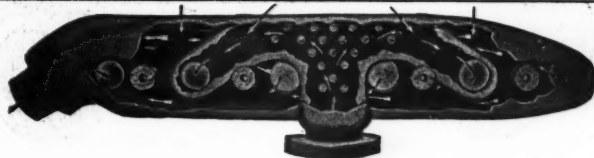
Has gained predominance in its price class by unmatched performance. All that a motor car should be, at a price that is surprisingly low.

117-Inch Wheelbase  
Valve-in-Head Motor

Elgin Motor Car Corporation, Argo, Ill.

## HOT-PIN MANIFOLD for FORDS

Exhaust and Pins Assure Uniform Heat Treatment of All Fuel	This Hot-Pin Chamber Breaks Up All the Fuel NO WASTE	Exhaust Gases Heat the Pin Chamber On All Sides
--	--	---



40% to 50% Increase in Gasoline Mileage  
Guaranteed or Money Refunded. Enlivens  
Low-Grade Fuel by Pre-Heating Mixture

Price \$16.50 complete. Send for Literature. Dealers Wanted

K. B. C. CO., Dept. B., 2015 Michigan Ave., CHICAGO

## Steel Tires & Mud Chains

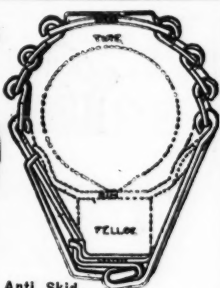


Old Tires  
Covered  
Complete



NO MORE PUNCTURES

Try 2 or 3 sections over  
any old blowout. Can't  
have blowouts, punctures;  
neither can the rubber  
wear off.



Anti Skid

Mud chains can be put on  
in a jiffy with one hand while  
standing on the running  
board. Hook the ends to-  
gether and push the little  
lever. If you get in a mud  
hole you will laugh out loud.

Special Prices to Those in New Territory

Kimball Tire Case Co., 173 Broadway Council Bluffs, Ia.

When Was  
Your Battery  
Tested?



It needs occasional attention or it will fail  
to work when you most need it.

USL Service Stations test all kinds of bat-  
teries free.

Take yours periodically and let them keep  
it up to its full strength.

U. S. Light & Heat Corporation, Niagara Falls, N. Y.

"KOOO"  
For  
Bearings

NON-FLUID OIL

"KOO  
Special"  
For Gears

New York & New Jersey Lubricant Co., 165 Broadway, New York

Starts Lubricating when  
the car starts without having  
to be melted by frictional  
heat.

Lasts longer  
At all  
~ Dealers  
In orange cans



## The "Big Stick" That Brings Down Gasoline Expense

Up goes the price of gasoline!  
Maximum mileage is the  
big problem of the  
day! Solve it with  
the new Strom-  
berg Carbu-  
retor.



The Official world's rec-  
ords made by the New Stromberg  
in gasoline mileage prove that you need the  
New Stromberg on your car. Mail coupon for details  
of how the New Stromberg will reduce your gasoline bills.  
Stromberg Motor Devices Co., Dept. 27, 64 East 25th St., Chicago

New **STROMBERG** Does it!  
CARBURETOR

# ECLIPSE BENDIX DRIVE



*Starts 155 Different  
Makes of Motor Cars  
and Motor Trucks*

Manufactured By  
**ECLIPSE MACHINE CO.**  
ELMIRA, N. Y.



**Schutte**  
SPORT BODIES

Built to Fit Any Make of Car.  
Disc Wheel Inclosures—For any  
wood or wire wheel.

CHARLES SCHUTTE BODY CO.

Lancaster, Pa.

## WARREN VAPORIZER

*Sold under absolute money back guarantee  
Vaporizes and changes gasoline into gas*

Just patented, simple, indestructible, no adjustments or  
movable parts, fool proof, easily installed.

**A REAL GAS SAVER—PRICE \$1**

With name, year and model, can fit your car.  
Try one ten days, you be the judge.

**Big Discount to Dealers, Live Agents Wanted**

JNO. W. WARREN, Patentee, San Antonio, Texas  
Reference: Any Bank or Trust Company in San Antonio

**GEARLESS  
DETROIT  
CRANK-SHAFT  
TIRE PUMP**

**960,000 PROSPECTS**  
With Cars between \$800 and \$1300

Now ready for Briscoe, Dodge, Chandler,  
Hudson, Overland, Reo, Hupmobile-R, and  
Studebaker cars. On and off in a jiffy  
without tools. Not a rubber diaphragm  
device. Write for details. Dealers, ask  
for discounts.

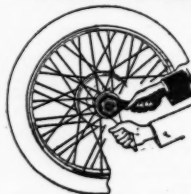
**Price \$12**

**DETROIT ACCESSORIES CORPORATION**  
2021 Gratiot Avenue, Detroit, Michigan  
Canadian Distributors  
Walkerville Hardware Co., Walkerville, Ont.



# KOL-BEN

**THE DOUBLE-LOCKED WIRE WHEEL**



Wrench is only tool re-  
quired. Locks or unlocks  
with ¼ turn. Positive  
lock—anybody can easily  
change wheels.

There isn't a more sensible way to increase  
the value, comfort, safety and convenience  
of your car than to equip it with Kol-Ben  
wire wheels. Impossible for them to run  
off or back off; put on or removed in 6 sec-  
onds, has four more spokes than any other  
wheel the same size, extra strong spoke lac-  
ing and so rust proofed and specially ena-  
melled that the beautiful finish lasts. Get  
complete details—learn of the wheel without  
a weakness.

**KOL-BEN WHEEL CO.**  
DETROIT MICHIGAN

## The "STERLING" UNIVERSAL JOINT

A real Joint—trouble and  
fool proof—properly lubri-  
cated and possessed of many  
new and unusual features

Western Sales Office: **THE BEARINGS COMPANY OF AMERICA**  
1012 Ford Building DETROIT, MICH. LANCASTER, PENNA.

## AUTOMOTIVE INDUSTRIES AUTOMOBILE

**T**HE industrial authority on all matters  
connected with the automotive industries.

The oldest weekly journal in the field.

Its scientific articles are complete and au-  
thoritative — its editorials of importance — its  
news accurate and valuable.

Published weekly, \$3.00 per year.

Canada, \$5.00; foreign, \$6.00.

239 West 39th Street, New York, N. Y.

**4-CYLINDER  
Waukesha MOTORS**

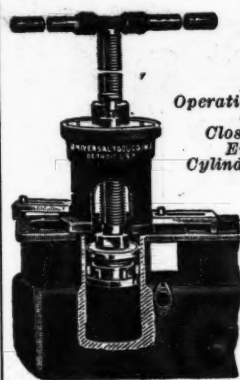
**FOR TRUCKS AND TRACTORS**

*Are the Product of the World's Largest  
Organization Devoted to the Building  
of Truck and Tractor Motors Exclusively*

**WAUKESHA MOTOR CO.**  
WAUKESHA, WIS.







### The New Improved Universal Cylinder Reboring Tool Is Mistake Proof

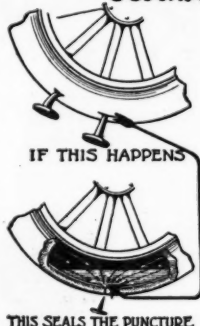
As simple in design as it is effective in action. Construction insures an absolutely rigid tool, with perfect centering device. Other new and revolutionary improvements that make cylinder reboring easy for any one to do.

Range of Expansion  $2\frac{1}{2}$ "-5 1/16"

Write for free illustrated literature with complete details. Give jobber's name.

THE UNIVERSAL TOOL CO., Inc.  
DETROIT 918 Beaubien St. MICHIGAN

### PEERLESS PUNCTURE-PROOF TUBES GUARANTEED AGAINST PUNCTURES



These tubes are guaranteed against punctures for 5,000 miles and adjustment will be made on a mileage basis. No red tape—no arguments. We know our product and know it will give satisfaction. We do not guarantee against blowouts, cuts or pinches, but we do guarantee against punctures.

And the cost is only slightly above the ordinary kind of tubes. This is a square business proposition through and through. Our guarantee means just what it says.

DEALERS:—This is an especially good opportunity for you. Get our proposition at once.

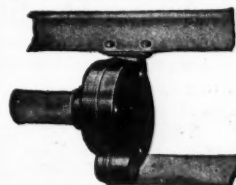
Peerless Puncture-Proof Tube Co.  
3030 McGee Trafficway Kansas City, Mo.

## Winton Six

War means strenuous work for everybody, and strenuous work demands steady nerves. Finish your day with a run into the open. Breathe off the day's burdens and insure restful sleep, soothed nerves, and the power to go forward another day.

Write for catalog

THE WINTON COMPANY  
424 Berea Road, Cleveland, Ohio



### THE Vacuum Muffler

It is really an *economy* muffler for it gives no back pressure, thereby increasing your power and conserving fuel.

The VACUUM MUFFLER is small, compact, easily cleaned, guaranteed blow-out proof, and will outlast the motor.

Model S made especially for the Ford.

VACUUM MUFFLER CORP.  
154 NASSAU STREET NEW YORK CITY



## GUARANTEE VISIBLE PUMPS

Fast service, full measure and perfectly filtered gasoline, assure dealers the constant patronage of satisfied customers.

Write for the Pump Book

Guarantee Liquid Measure Company  
Farmers Bank Bldg. PITTSBURGH, PA.

## Selden Trucks

Light Delivery 1, 2, 3½ and 5-Ton

Write for full information on the  
Selden Line



DEALERS: Write or wire for desirable territory

Selden Truck Sales Company  
Rochester, N. Y., U. S. A.

## BAR OUT ALL BOTHER AND BREAKAGE

The most dependable defense ever devised against danger and damage is provided in

HIGGINS QUALITY SPRINGS for Replacement

Guaranteed alike at all points. Made without center bolt or hump. Possess resiliency that protects car. Sturdy strength that gives longest wear. Safest to order for own use. Most certain to satisfy customers.

Splendid discounts to dealers. Immense demand.

Write for discounts and catalog C-1917  
HIGGINS SPRING & AXLE CO., Dept. 21, Racine, Wisconsin

NO BOLT-NO HOLE-NO HUMP-NO JOLT

### Blood Bros. Universal Joints

Save trouble—use joints that retain grease and require less attention. The only high grade, positively lubricated, "CAN-LESS" joint made. Six sizes. For automobiles, motor trucks, tractors and other uses. Prices and full description on application.

Ask for Booklet E

Blood Bros. Machine Co

"Pioneer Makers of Universal Joints"

ALLEGAN  
MICH.

Ask for Booklet

A Can-less Joint



# Disco

DEPENDABLE PRODUCTS

## Electric Lighting and Starting System For FORD Cars

You will be safe in buying or handling the Disco System, because it is made by the strongest company in this field. The financial and personal standing of the Disco organization is an absolute guarantee of satisfaction.

Let us prove this to you

DISCO ELECTRIC MANUFACTURING COMPANY  
DETROIT

Save  
Gasoline!



—And Get More Profit  
Save customers money and trouble—  
increase motoring pleasure—and make  
more profit by selling

**ECON-O-KLEEN**  
IMPROVES GASOLINE—BURNS CARBON

It helps solve your present day problem of help shortage, increased overhead costs and grouchy customers.

It adds oxygen to the gasoline mixture, burning it clean. Guaranteed to clean out and prevent carbon—to add 15% to 30% to gasoline mileage—to be absolutely free from picric acid and other injurious chemicals. Send \$1 for trial can, prepaid. Treats 112 gallons.

**Dealers** Your customers will buy Econ-O-Kleen, and repeat. Write for terms

**ECON-O-KLEEN FUEL CO.** 104 Labree Avenue  
Thief River Falls, Minn.

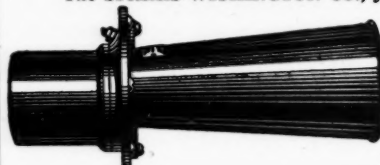
**AT WATER  
KENT**  
SCIENTIFIC IGNITION

ADDRESS ALL COMMUNICATIONS TO  
4934 STENTON AVE., PHILADELPHIA.

## SPARTON PRODUCTS

First Choice of  
America's Best Cars

Sparton Motor-Horns—Hand-Operated and Motor-Driven. Sparton Gasoline Vacuum Systems, Sparton Honeycomb Radiators and Sparton Radiator Fans  
The SPARKS-WITHINGTON CO., Jackson, Mich., U. S. A.



Pacific Coast  
Representative

**NORMAN  
COWAN CO.**  
San Francisco  
Calif.



## Guaranteed for 10,000 Miles Bricton Pneumatic Tires

Every Bricton Tire is sold under a specific 10,000 mile written service guarantee. This guarantee is the longest and strongest ever put behind a pneumatic tire and is a positive protection to every purchaser. Bricton Tires are Puncture-Proof, and proof against blowouts, skidding, ruts, rim-cuts, oil and gasoline. Wonderful resiliency, easy riding qualities and economy commend them to every car owner.

**Retread Your Present Tires**—If your present tires are new, or if your tires have been used and the rubber tread has been worn off or thin, protect them with Bricton Treads and get greater service out of your tires and also make them puncture proof, oil proof, rut proof, gasoline proof and non-skid.

**FREE TRIAL OFFER**—To convince you Bricton Tires will give you satisfaction you may try them on your car at our expense. Write today for this Free Trial Offer, a copy of our guarantee and full information about Bricton Tires and Treads.

**THE BRICTON MFG. CO.**

1015 to 24 Woodmen of World Building  
Dept. 1298 OMAHA, NEBRASKA



## VULCAN QUALITY AUTOMOBILE SPRINGS

Immediate shipment, VULCAN seven leaf heavy, oil tempered, fronts for the Ford. 588 other types, 90,000 springs in stock. Liberal discounts.

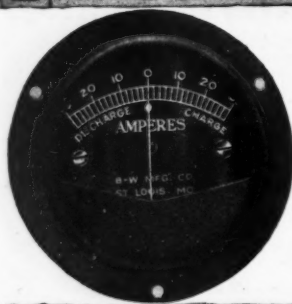
**JENKINS VULCAN SPRING CO.**

Factory and General Offices, Richmond, Indiana

Branches with full stocks:

St. Louis, Missouri	- - -	1402 Chestnut Street
Minneapolis, Minn.	- - -	1024 Hennepin Avenue
Dallas, Texas	- - -	209 South Houston Street
Reading, Pa.	- - -	538 Franklin Street
Sumter, S. C.	- - -	29 Caldwell Street

## B-W DIRECT CURRENT



STURDILY CON-  
STRUCTED to retain  
accuracy under the most  
severe conditions. Hand-  
some in appearance. Made  
in both flush and sur-  
face types. Finished in  
bright nickel or black  
rubberoid as desired.

**Better Ammeters  
Cannot Be  
Purchased**

Send for Literature  
**Ballman-Whitten Mfg. Co.**  
4060 Forest Park Bl.  
ST. LOUIS  
O.

**AMMETERS**

## BURD High Compression PISTON RINGS

"The Accepted Standard"

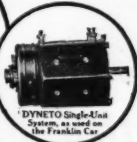
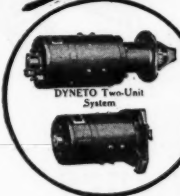
**BURD HIGH COMPRESSION RING CO.**  
ROCKFORD, ILLINOIS  
Sales Offices in All Principal Cities.





## STARTING LIGHTING SYSTEMS

THE DYNETO shows greatest efficiency in both motor and generator. Type D. A. Motor develops a torque of approximately 15 pounds. Type C. A. Generator shows approximately 15 amperes. A car-speed of 15 to 20 M. P. H. keeps batteries fully charged. Starter always sure to start. Lamps always bright. Send drawings and specifications for our recommendation. **Special Outfits for Fords**

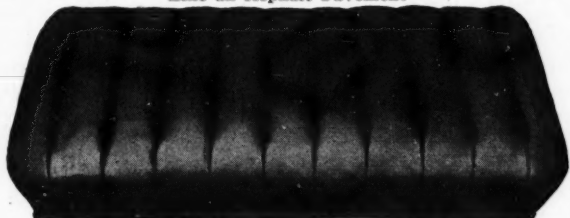


DYNETO ELECTRIC CORPORATION, Syracuse, N. Y.

Make Your Ford Ride Like a Packard or Pierce Arrow with a

## Cathedral Pipe Deluxe Cushion

The Only Cushion in America That Makes All Kinds of Roads Seem Like an Asphalt Pavement



No Shock Absorbers Necessary. Sold Under a Positive Guarantee to Make Your Car Ride 100 Per Cent Better or Your Money Back.

Let Us Tell You More About It.

American Cushion Spring Co., Dept. A, Kalamazoo, Mich.

## Keep Things Moving by Selling Simplicity

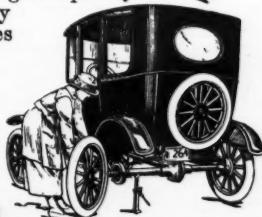
### Demountable Wheel Outfits FOR FORD CARS

Right now, when cars are hard to get, meet your overhead by stocking and selling Simplicity Demountable Wheel Outfits. Every Ford owner needs them—sales come quick, profits are good.

Simplest Demountable Outfit made—goes on regular Ford Hubs. No over-sizing front tires. Entire wheel changed anywhere in four minutes or less.

WRITE FOR PRICES  
AND TERMS TODAY

**SIMPLICITY WHEEL CO.**  
Section A Grand Rapids, Mich.



## THE SIOUX WAY

Tools are the best on the market for  
**Re-facing — Re-seating — Grinding**  
any and all valves

**Demand the Best—the "Sioux"**

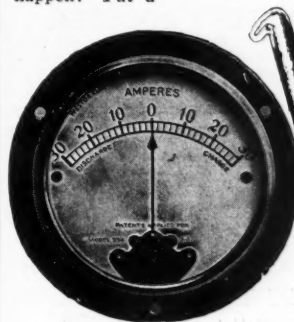
All good jobbers sell them

Circular matter sent on request

**ALBERTSON & COMPANY, Mfrs., SIOUX CITY, IA.**

## No Lights! No Spark! Now What?

What if your electrical equipment should fail you on a black night, suddenly, without warning, on a bad part of the road? Don't let it happen! Put a



# Weston

On Your Dashboard or Cowl

It is the reliable means of determining the proper rate of charge or discharge of your battery for various speeds. It enables you to determine that the generator is working and that the storage battery is receiving its proper charge. Write us!

**Weston Electrical Instrument Co.**  
10 Weston Ave., Newark, N. J.  
23 Branch Offices in the Larger Cities



THE Mercer shield is the badge of fastidious taste in automobile. Mercer means the utmost in substantial smartness, riding comfort, and power. The possessor of a Mercer invariably feels a bit better satisfied than the owner of another car. Correspondence from dealers invited.

**Mercer Automobile Company :: Trenton, N. J.**  
800 Whitehead Road

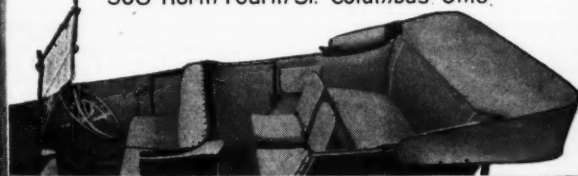
"EASY ON"  
SEAT COVERS  
TIRE COVERS  
TOP RECOVERINGS

## GORDON

WE HAVE  
PATTERNS FOR  
MORE THAN A  
THOUSAND MODELS  
OF CARS.

Sold by leading Jobbers and Dealers everywhere  
Write for Sample Book and Price List

**The J. P. GORDON CO.**  
308 North Fourth St. Columbus Ohio.



## KINGSTON IGNITION DEVICES

High and low tension magnetos, make-and-break coils, dash coils, box coils, motorcycle coils, switches, spark plugs and other ignition specialties. Guaranteed satisfaction.

WRITE FOR CATALOG

**KOKOMO ELECTRIC COMPANY, Kokomo, Ind.**

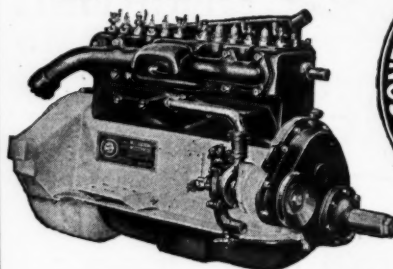


## FREE! To Motorists

Do you know why some car owners get over 15,000 miles from their tires? Do you know how Maurice Costello, the popular movie star, secured over 25,000 miles from his tires and won the \$300 Ajax Tire prize? Do you know why certain weather reduces your mileage? Do you know why sand pockets appear? Why oil and grease injure the rubber and fabric? Why spare casings and tubes deteriorate? All these questions are answered in our book, "Care and Repair of Tires," sent to any car owner free. Write today.

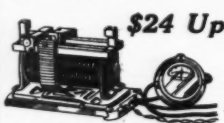
C. A. SHALER CO., 233 4th Street, Waupun, Wisconsin  
Largest Manufacturers of Vulcanizers in the World

Standard Power for  
Automobiles and Trucks



**Continental Motors**  
Detroit Michigan

### Charge Your Own Battery and Save Money



Circular No. 24 on Request

At an average cost of 6c per battery anyone can charge his own starting and lighting batteries.

#### F-F BATTERY BOOSTER

Simple & safe—anyone can understand its operation in a few minutes. Attaches to any electric light socket.

THE FRANCE MFG. COMPANY  
Cleveland Ohio



### BEST SELLING ACCESSORY on the MARKET

The Roedding Safety rear-end automatic signal device ever perfected. Car and truck owners buy at first demonstration.

Write for our attractive dealer proposition  
K. G. BARKOOT, 1010 Chamber of Commerce Bldg., Detroit

## BURKE AUTOMOBILE PRODUCTS

Real Estate Trust Building.....PHILADELPHIA  
First National Bank Building.....CHICAGO  
2010 Broadway.....NEW YORK

## LAY Porta Power Mechanical Farm Hand

Mfd by L-A YOUNG INDUSTRIES Inc. Detroit Write for Dealers Proposition



### Protect Your Ford—Equip It With a GOODRICH IGNITION LOCK

The new Goodrich Steering Column Lock fits all cars—Can be installed by the owner himself. Write for literature.  
GOODRICH-LENHART MFG. CO., 419 Widener Bldg., Philadelphia



Inner armor for automobile tires prevents punctures and blow-outs. Double mileage of any tire, old or new. Easily applied without tools. Used over and over in several tires. Will not heat or pinch. Cheaper and better than double treads, etc. Details free. Distributors and agents wanted. Sales guaranteed.

AMERICAN ACCESSORIES CO., 250 Gulow St., Cincinnati, Ohio

## SUNDERMAN Vacuum Carburetor

SUNDERMAN CORPORATION, 11 Chambers St., Newburgh, N. Y.

## BETHLEHEM Internal Gear Drive MOTOR TRUCKS Dependable Delivery

The Motor Truck bought today without Electric Starting and Lighting will be out of date to-morrow

The Motor Truck bought today without Electric Starting and Lighting will be out of date to-morrow

BETHLEHEM MOTORS CORP'N. ALLENTOWN, PA.

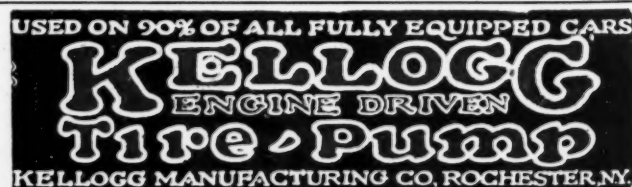
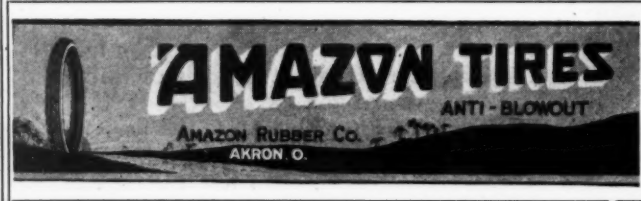
TURN TO PAGES 82 AND 83 AND  
READ THEM OVER CAREFULLY

### APPLY A NEW TOP COVER

TO YOUR OLD CAR AND MAKE IT LOOK LIKE NEW  
Prices \$8.00 to \$17.00. Parcels Postpaid

You Save 2/3 Price of a new Top, and can apply it yourself. Why new ones. Get our catalogue. It's a money saver.

We specialize in Top Covers, Auto Tops, Tires, Seat Covers  
Liberty Top & Tire Co., 126 E. 8th St., Cincinnati, O.





# THE CLEARING HOUSE

OF THE MOTOR INDUSTRY

FOR PARTS, ACCESSORIES, TIRES, MACHINERY, REBUILDING, REPAIRING, WELDING AND USED CARS.  
ALSO HELP AND SITUATIONS WANTED AND MISCELLANEOUS CLASSIFIED ADVERTISING

AUTO SALVAGE  
BULLETIN  
No. 8

# WE SAY!

**"YOU MUST BE SATISFIED"**

*Our Business Methods Live Up to This Saying*

Used Parts for Any Models  
of the Following Manufacturers' Makes:

Abbott-Detroit	Little
American	Locomobile
Apperson	Lozier
Atlas	Marmon
Atterbury	Marquette
Auburn	Matheson
Bergdoll	Maxwell
Brush	Michigan
Buick	Mitchell
Cadillac	Moline
Carter Car	Moon
Case	National
Chadwick	Nyberg
Chalmers	Oakland
Chase	Ohio
Cino	Oldsmobile
Cole	Overland
Crow-Elkhart	Packard
Dorris	Paige
Elmore	Palmer-Singer
E-M-F 30	Parry
Everett	Peerless
F.A.L.	Pierce-Arrow
Firestone	Pope Hartford
Flanders	Pope Toledo
Ford	Premier
Franklin	Rambler
Garford	R.C.H.
Gleason	Regal
Glide	Reo
Great Eagle	Schacht
Great Northern	Seldon
Great Smith	Speedwell
Great Western	Stafford
Havers	Stearns
Haynes	Stevens-Duryea
Herff-Brooks	Stoddard-Dayton
Henderson	Studebaker
Hudson	Stutz
Hupmobile	Thomas-Detroit
International	Velie
Interstate	Vim
Jackson	Warren
King	Wayne
Kissel	Westcott
Knox	Winton
Krit	

It Is No Wonder That We Are the  
World's Largest Used Parts Concern

For years we have made our every customer a satisfied customer. It has been the means of our having OUR THREE GREAT BRANCHES and also THE GREATEST USED PARTS STOCK.

We can meet your every need in the way of Auto Parts, with better goods, better prices, faster service.

**WRITE US FIRST**  
**GET OUR PRICES**  
**REMEMBER**

*Anything for Any Automobile*

**"The World's Largest Used Parts Concern"**  
**IS BETTER ABLE TO SERVE YOU**

### OUR GUARANTEE

You must be satisfied. Any article purchased from us which does not give complete satisfaction, may be returned at our expense. Your money cheerfully refunded.

**GUARANTEED SAVING OF**  
**35 to 90%**

*"We May Not Be the Nearest to You but We Will Go the Farthest to Serve You"*

WATCH NEXT WEEK FOR OUR BULLETIN No. 9

# AUTO SALVAGE CO INC.

KANSAS CITY, MISSOURI  
1701-03 Main Street

ST. LOUIS, MISSOURI  
2823-25 Locust Street

CINCINNATI, OHIO  
314 E. Third Street

# —The— Original Auto Parts Co., Inc., of St. Louis

St. Louis, Missouri

## 50 to 90% Saving on Used Parts

The Pillars of Our Success are Based on Our

*Reasonable Prices*  
*Service*  
*Reliability*

### New Gears and Axle Shafts

We have in stock new gears and axle shafts for many makes of cars for less than factory list. Send in old part; we will match it up for you, or give complete description.

### Our Guarantee Is Your Protection

Any Part, or article, purchased from us, which in your estimation does not give entire satisfaction or fit, may be returned to us and your

Money Cheerfully Refunded

**DEALERS** Our New Bulletin on Parts, Supplies and Material is ready. Write for it today.

### Parts for Following Cars All Models

Abbott-Detroit	Mitchell
Allen	Moline
American	Moon
Auburn	National
Bergdoll	Nyberg
Brush	Oakland
Buick	Ohio
Cadillac	Oldsmobile
Case	Overland
Chalmers	Packard
Chase	Paige
Cole	Palmer
Crow-Elkhart	Palmer-Singer
Detroit	Parry
Dorris	Peerless
Elmore	Pierce-Arrow
E-M-F 30	Pope Hartford
Everette	Pope-Toledo
F. A. L.	Premier
Flanders	Rambler
Ford	R.C.H.
Franklin	Regal
Garford	Reo
Glide	Seldon
Great Western	Speedwell
Haynes	Stafford
Herff-Brooks	Stearns
Hudson	Stevens
Hupmobile	Duryea
International	Stoddard
Interstate	Dayton
Jackson	Studebaker
King	Stutz
Kissell	Thomas
Krit	Detroit
Lexington	Vellie
Lozier	Vim
Marathon	Warren
Marmion	Wayne
Maxwell	Wescott
Michigau	Winton

*And Many  
Others*

### MOTORS—Guaranteed

Abbott	\$75.00
Buick, Model 10	60.00
Case, Model 40	75.00
Cadillac, Model 1914	150.00
E. M. F., Model 30	50.00
Flanders, Model 20	50.00
Packard, Model 1909	85.00
Premier 6 cylinder	100.00
Reo 1910	60.00
Mitchell 6 cylinder	75.00
Overland 42	50.00
Overland 59	60.00
Vellie	75.00
Marmion	90.00
Rutenberg	125.00
Michigan 40	100.00
R. C. H.	50.00
Moon 40	75.00
Chalmers 40	90.00
Oakland 30	75.00
Vellie 12	100.00
Mitchell 15	100.00

### UNIT POWER PLANTS

Chalmers 6, 1913	\$125.00
Vellie	125.00
Marathon	85.00
Detroit	90.00
Paige 25	90.00
Imperial	100.00

### RADIATORS

Vellie 1912	\$20.00
Stutz, 1912	25.00
Maxwell Sps.	17.50
Mitchell, 1915	22.50
Flanders	15.00
Mitchell 1911	16.50
Chalmers 40	20.00
Imperial	20.00
E-M-F	15.00
Krit, 1914	17.50
Reo	15.00
Haynes, 1911	20.00
Hudson 37	22.50
Kline Car	20.00
Marmion, 1911	20.00
Chalmers 30	17.50
Regal, 1911	17.00
Chandler, 1916	30.00
Empire 29	16.00
Detroit 1914	18.50
Moon, 1911	17.50
R. C. H., 1913	15.00
Marathon, 1912	17.50

### NEW RADIATORS

Overland 85	\$22.50
Ford	22.00

### NO MATTER WHAT YOU NEED

NEW PARTS—SUPPLIES  
USED PARTS—MATERIALS

**We Can Save Money for You**

**Write to Us—Let Us Convince You—Write Today**

Reasonable  
Prices

—THE—  
ORIGINAL Auto Parts Co., Inc., of St. Louis  
St. Louis, Missouri

Reasonable  
Prices

Service

Service

Reliability

Reliability

Branch:  
Auto Parts Co.  
Davenport, Iowa

Buy W.S.S.



# More Bargains and Immediate Delivery

*"We Tear 'Em Up and Sell the Pieces"*

MOTORS			
Everett 30	\$40.00	Henderson 4-cyl.	75.00
Flanders 20	50.00	Locomobile 1910	75.00
E M F 30	50.00	Empire 25	75.00
Studebaker 25	50.00	G M C Truck	75.00
Studebaker 4-15	75.00	Cadillac 1912	75.00
Studebaker 6-17	100.00	Cadillac 1914	125.00
Overland 56	50.00	Reo 1914	85.00
Overland 69	65.00	Buick 25	90.00
Overland 79	75.00	Chalmers 6 1915	100.00
Overland 80	75.00	UNIT PLANTS	
Overland 93	75.00	Chalmers F	\$75.00
Peerless 45 H. P.	50.00	Chalmers 17	100.00
Firestone-Columbia	50.00	Haynes 1910	75.00
Mitchell 4-40	60.00	Menominee Truck	75.00
Mitchell 6-17	125.00	King 1914	100.00
Stoddard Dayton 30	60.00	Auburn 1914	100.00
Stoddard Dayton 45	75.00	Abbott Detroit 1912	100.00
Stoddard Dayton Savoy	75.00	Paige 36 1914	100.00
Moon 1912	60.00	Nyberg 6	100.00
Moon 1913 Model 48	75.00	Cole 6	150.00
Case 1911	60.00	Vellie 6 1917	200.00
Stearns 1911	60.00	MAGNETOS	
Kissel 40	75.00	Dixie	\$20.00
American 30	75.00	Mea	25.00
Vellie 40 1912	75.00		

Bosch N U 4	20.00
Bosch D R 4	25.00
Bosch D U 4	30.00
Bosch Z R 4	40.00
Bosch Z R 4 Dble Head	125.00
Bosch D 6	25.00
Bosch D R 6 or D U 6	35.00
Bosch Z R 6	50.00

## TRANSMISSIONS

Buick 25	\$30.00
Buick 17	35.00
Buick 30 with clutch	35.00
Buick 30 with clutch	35.00
Vellie center control	40.00
Winton 4 speed	50.00
Reo 1912 center control	30.00
Reo 1914 center control	40.00
National	35.00
Kissel 40 H. P.	35.00
Warren 30	30.00
Pierce Arrow	35.00

## MISCELLANEOUS

Starters	\$15.00—\$30.00
Generators	12.50—20.00

Rear Axles	25.00—75.00
Front Axles	5.00—10.00
Wheels	2.00—7.50
Rims	2.00—3.00
Springs	2.00—4.00
Spring leaves	.25—50
Radiators	10.00—30.00
Lamps, pair	3.00—5.00
Windshields	5.00—10.00
Jacks	1.00—8.75
Spot lights with mirror	3.50
Reeliners 28x2 1/4—28x3	.75
Reeliners 30x3	1.00
Inside Blowout Patches 3-3 1/2	.20
Inside Blowout Patches 4-5 in.	.25
Outside Lace Patches 3-3 1/2 in.	.50
Outside Lace Patches 4-5 in.	.60
Outside Hook on Patches 3-3 1/2	.25
Outside Hook on Patches 4-5 in.	.50
Cold Patches, doz.	.10
Spark Plugs with Priming Cup	.50
Metal Polish	10c-15c-25c
Polishing Cloth	.05
Tire Cover	.50
Speedier for Motorcycle	.50
Speedier for Auto	.50

*Highest Banking References Are Behind Our Guarantee  
of Absolute Satisfaction or Money Promptly Refunded*

# AUTO WRECKING CO. 13th and Oak Streets Kansas City, Mo.

## Rapid Fire Service and Lowest Prices ON GOOD SERVICEABLE PARTS FOR ALL CARS

*If We Cannot Satisfy You, Money Cheerfully Refunded*

### SPECIAL MOTOR BARGAINS

All in excellent condition	
4 cyl. 1914 Mitchell	\$100.00
4 cyl. 1913 Big Mitchell	100.00
4 cyl. 1914 Mitchell starter and generator	125.00
1914 Oldsmobile (Defender model)	100.00
4 cyl. Oldsmobile (Autocrat model)	150.00
6 cyl. Thomas Motor (cast in pairs)	125.00
1911 Packard	100.00
1912 36 Pierce Arrow	125.00
New Marion Motor	100.00
4 cyl. 1914 Moon with starter	100.00
4 cyl. 1913 Buick	85.00
1913 Atlas	75.00
6 cyl. 50 H. P. Rider-Lewis (fine for boat)	100.00
1914 Marmon	100.00
1915 Kirt	65.00
83 Overland with starter	85.00
6 cyl. 1914 Jeffery with starter and generator	125.00
6 cyl. Everitt	85.00

### UNIT POWER PLANTS

4 cyl. Continental—complete	\$100.00
4 cyl. Milwaukee—complete	100.00
1914 Lozier 6	200.00
1914 Premier with starter	150.00
4 cyl. Chalmers 30	65.00
6 cyl. Stevens-Duryea—complete	150.00
4 cyl. 1913 Abbott-Detroit with starter and generator	150.00

1914 Allen	\$115.00
1917 6 cyl. Regal	100.00
1915 6 cyl. Master Chalmers	150.00
1916 6 cyl. Chalmers 30	125.00
1914 6 cyl. Cole	135.00
1914 6 cyl. Oldsmobile	135.00
Buick 35	100.00
1916 Le Roi	65.00
Hupp 20	40.00

Liberal allowance made on your old motor

Cylinder Blocks, Pistons, Shafts, etc., for most all motors

### MAGNETOS

Overhauled and Guaranteed	
DU4 Bosch Set Spark	\$18.00
DU4 Bosch Variable Spark	22.50
DU6 Bosch	27.50
DR4 Bosch	18.00
DR6 Bosch	22.50
D4 Bosch	15.00
D6 Bosch	17.50
NU4 Bosch	15.00
ZR6 Bosch	35.00
Eisemann Dual	15.00
Remy Model RL & D	7.00
Dixie Mags.	12.00
We carry in stock all magneto parts	

### GENERATORS

Gray & Davis	\$15.00
Ward Leonard	12.00
Remy	18.00
Vesta	12.00
Beardon	12.00
Apde	10.00

### STARTERS

Gray & Davis	\$15.00 to \$20.00
Remy	15.00
Ward-Leonard	20.00
Auto Lite, Bendix Drive	25.00
Auto Lite, Gear Drive	20.00
Wagner	25.00
Westinghouse	25.00
Delco	25.00

### COILS

Bosch Type A	\$7.00
Eisemann	4.00
Spiltdorf	4.00
Simmis, H. T.	12.00
Mea	10.00
Silent Starter and Generator Chains; all lengths and sizes.	

### NEW HEADLIGHTS

Gray & Davis 12-in. face, two bulb	\$5.00
Special 12-in. face, two bulb type	4.00
New steering posts	5.00

### SECOND-HAND CAR DEPT.

\$150.00 to \$550.00  
50 to 75 exceptionally good used cars at prices so low that they would even interest dealers.

### PREST-O-LITE TANKS

P-Presto Tanks	\$5.00
P-Presto Tanks	4.00
Searchlight	3.00

### SPEEDOMETER HEADS

Stewart or Warner	\$1.50 to \$4.00
-------------------	------------------

### RIMS

All Styles and Makes

Stanweld	\$2.50
Funk	2.00
Reversible Firestone	2.00
Continental	2.50
All other makes	1.50

### TIRES AND TUBES

We wreck many cars every day and thus obtain great quantities of exceptionally good Tires and Tubes at prices that will interest you.

New Steering Posts	\$5.00
Front Axles	\$5.00 to \$10.00
Rear Axles	15.00 to 40.00
Radiators	10.00 to 35.00
Transmissions	15.00 to 100.00
Carburetors	5.00 to 9.00
Bearings	.50 to 3.50
Springs	1.00 to 3.50
Transmission Gears	1.00 to 5.00
Differential Gears	5.00 to 10.00
Axle Shafts	2.00 to 8.00
Gasoline Tanks	1.00 to 5.00
Lamps	.50c to 5.00
Windshields	3.50 to 8.00
Spotlights	3.50
Stewart Vacuum Tanks	4.00
Carter Tanks	2.50

Mail Orders Shipped Same Day

**WARSHAWSKY & CO., Largest Car Wreckers in the West**

Phone Calumet 7315

1915 S. State St., CHICAGO, ILL.

When Writing to Advertisers, Please Mention Motor Age

Parts and Repairs.

Parts and Repairs.

Parts and Repairs.

# PARTS FOR ALL CARS

We Save You 50 to 80% of the Original Cost

**MAGNETOS—Overhauled and Guaranteed**

Bosch DU Set Spark.....	\$17.50
Bosch DU4 Variable.....	22.00
Bosch DU6.....	25.00
Bosch DR4.....	17.50
Bosch DR6.....	22.00
Bosch D4.....	14.00
Bosch D6.....	15.00
Eisemann.....	10.00
Remy.....	7.00
Dixie.....	10.00
Coils, Generators and Starters. Silent Starter and Generator Chains, all lengths and sizes.	

Lighting and Starting Batteries, \$6.00 to \$15.00	
Carburetors	Springs
Front Axles	Transmission
Rear Axles	Gears
Transmissions	Differential Gears
Axle Shafts	Rims
Presto-Lite Tanks, size B \$4.75; E.....	\$3.50
Searchlight Tanks.....	\$2.50
Roller Ball Bearings (All Makes) \$1.00 to \$3.50. Pistons, Cylinder Blocks, Crank and Camshafts, Radiators, etc. Many good motors in stock.	

Tell us your needs

In wrecking cars we obtain and always have for sale a complete stock of parts for all makes of cars. Also tires and tubes whereby we can save you from 50 to 80 per cent

## OUR SLIGHTLY USED TIRES AND TUBES

MEAN ECONOMY TO MOTORISTS :: A TRIAL WILL CONVINCE YOU

Size	Tires	Tubes	Size	Tires	Tubes	Size	Tires	Tubes
30x3.....	\$4.00	\$1.35	32x4.....	\$7.00	\$1.60	35x4.....	\$8.50	\$1.80
30x3½.....	5.00	1.45	33x4.....	7.75	1.70	36x4½.....	9.25	1.85
31x3.....	5.25	1.50	34x4.....	7.75	1.70	37x4½.....	8.75	1.90
32x3½.....	5.50	1.50	35x4.....	8.00	1.75	38x5.....	9.50	2.00
34x3.....	6.00	1.60	36x4.....	8.00	1.75	39x5.....	9.50	2.00
31x4.....	6.25	1.65	34x4½.....	8.25	1.75	37x5.....	10.00	2.20

SPECIAL—Four 41x5 Tires, Rims and Tubes, \$80.00

PROMPT ATTENTION TO MAIL ORDERS

No Mileage Guarantee on Used Tires

Deposit Required with All Orders

MOTOR SALVAGE CO., 1425 State St., Chicago, Ill.

## Used Auto Parts

### Company

Joplin

Missouri

### PARTS FOR 200 Cars

Our immense stock assures you of getting what you want, very quickly and at a saving of from

50 to 75%

We have:

Motors	Radiators
Transmissions	Crankcases
Rear Axles	Crankshafts
Magnetos	Cylinder Blocks
Generators	Springs
Starters	Bearings
Coils	Wheels
Carburetors	Most Gears

In fact, any part you may desire. It will pay you to let us have your order. Money refunded if goods are not satisfactory.

GET OUR PRICES TODAY

No matter how large or small your order is, it will be handled promptly and carefully, "The Key to Our Success."

### —POPE HARTFORD PARTS—

Buy your parts for all models of Pope Hartford cars from the only legitimate and authorized manufacturers—who own the original drawings, patterns, tools and fixtures and are making these parts daily. Don't buy and use second hand parts. They may be the cause of serious accidents and result in much additional expense in the long run.

**THE HARTFORD MOTOR CAR CO.**  
410 Main Street Hartford, Conn.

## WICHITA AUTO WRECKING CO.

805-809 W. Douglas Ave.

### EXCEPTIONAL VALUES IN MOTORS

We have parts for the following cars:	
American Underlung	McFarland Six
Auburn 30-40	Marathon 30-40
Buick F-10-16-17-19-25-28-29-30-31	Marmon 30—Rear axle & transmission
Burg 40	Maxwell 2 & 4 cylinder;
J. L. Case 40	K-Q-25—Mitchell 40
Carter Car 5A-L-R	Monarch 40
Chalmers F-K-L & Six 10-11M-18—Clark 40	Mason "May Tag" 4 cyl.
Cadillac 1909-1910	Monarch 40—Moline
Cameron—Crawford	Monroe
Detroit—Egger 40	Overland 30-32-35-38-41-42-52-56-59-69-71-75BR-79-81-83
E. M. F. 30—Pal Car	Oldsmobile 40
Flanders 2 & 3 speed	Oakland 2 & 4 cyl. 30-40
Firestone Columbia	Packard 1910—Premier
Fuller	Paige Detroit 25 H. P.
Ford—N. R. & S.	Fullman 40
Great Northern	Reo 2 & 4 cyl. 4th & 5th
Halladay—Haynes 1910	Rider Lewis—Sellers
Herrshoff—Hupp 20	Rambler 34-40-44-53
Hudson 20	R. C. H.—Regal 30
I. C. H., 2 & 4 cylinder	Stoddard Dayton 40
Jackson 2 & 4 cylinder	Studebaker 14-25-35
Olympic-Majestic 45-50E	Valve 30-40
Kissel Kar 40	Winton Six
King—Knox 40	Wayne
Lambert 2 & 4 cylinder	
Lexington 40	

Complete Motors, Transmissions and Rear Axles. Money refunded on all parts within 10 days if unsatisfactory.

Buy your parts in WICHITA, KANSAS

## Parts Parts Parts

New and Used

If you live west of the Rocky Mountains, send to San Francisco and save money on your auto parts. Everything from 50% to 75% of manufacturer's list price. Parts for over 200 makes and models of cars from the oldest to the latest.

### Motors Motors Motors

Over 100 in stock of all makes and sizes, fully guaranteed, \$25.00 up.

Radiators, crank-cases, crank-shafts, cylinders, blocks, gears, wheels, springs, bearings, magnetos, coils, lamps, tires, rims, rear-axles and transmissions.

The Auto Exhibit & Supply Co. service is unequalled. All mail orders filled same day; small remittance sufficient to cover express charges with all orders. We guarantee satisfaction or money refunded. Write for prices. The largest parts company west of the Mississippi.

**Auto Exhibit & Supply Co., Inc.**

523 Golden Gate Avenue  
SAN FRANCISCO CALIFORNIA  
Los Angeles Branch, 1130 So. Main Street

## Real Bargains

## Low Prices

## Puritan Quality

The low graceful one-man top adds much to the appearance of any car. The earlier model cars can be fitted with the new made-to-order top at a very reasonable price. The car is not laid up, for the work can be done quickly. Best materials are used and the work is under the supervision of one of the best top men in the country.

Five passenger, one-man mohair top.....\$45.00  
Seven passenger, one-man mohair top.....47.50  
Roadster passenger, one-man mohair top.....27.50  
Ford Touring one-man mohair top.....37.50  
Ford Roadster one-man mohair top.....25.00  
The above prices include a complete one-man top with storm curtains and top dustproof boot, together with fittings for properly attaching front of the top to any wind shield.  
We build all weather curtains and tops for every make of car.

### Electric Lighting System for Fords

Generator, switches, two dash lamps, tail lamp battery, automatic generator cut-out, all wire brackets, bolts, complete ready to install....\$10.00  
With spotlight.....11.98  
This outfit is installed without removing fan or radiator.

### Accessories for Fords

Lighting and dimming switches.....	\$ 1.00
Pedal pads, per set.....	.35
Steering stabilizers.....	3.85
Cut-outs for Fords, complete.....	1.00
3-inch blowout patches.....	.45
3½-inch blowout patches.....	.50
Electric lighting systems.....	10.00
Electric head lamps for Fords.....	4.50
Spotlight with mirror.....	4.25
Oil tail lamps.....	1.75
Champion spark plugs, each.....	.65
Champion spark plugs, per dozen.....	6.00
U. S. tire gauges (\$1.50 values).....	1.00
Sandow spark plugs, each.....	.35
Sandow spark plugs, per dozen.....	3.50
Leak proof piston rings, each.....	1.00
Leak proof piston rings, per dozen.....	10.00
Stewart speedometers.....	7.50
Double action tire pumps.....	2.00
Automobile jacks.....	1.90
Bucket seats, racing type (per pair).....	16.50
Hayes Crown Fenders (set four).....	20.00
Long slope speedsters fenders (set four).....	10.00

## Puritan Machine Co.

49 Puritan Building

10th and Lafayette Sts., Detroit, Mich.

## OTHERS SAVE!

## WHY NOT YOU?

Almost 50% Saved on Your Tire Bills

Write Us for Price List

### NEW TIRES USED TIRES

### DOUBLE TREAD TIRES

SERVICE AND SATISFACTION GUARANTEED

—PARTS FOR ALL AUTOMOBILES—

Gears, Shafts, Bearings

Write us your needs

AUTO NEEDS COMPANY

1602 S. Michigan Ave. Chicago, Ill.

### New Parts for ORPHAN CARS

We make a specialty of furnishing new gears and axle shafts, axles, repair parts for motors and transmissions for cars that have been discontinued.

### CUTTING MOTOR CARS

CLARK CARTER CARS

MILWAUKEE MOTOR

(All cars using same)

CONTENTAL ENGINE CO.

(Repair parts)

MASON MOTOR CARS

IMPERIAL MOTOR CARS

L. C. ERBES & CO.

2652 W. University Ave. St. Paul, Minn.

When Writing to Advertisers, Please Mention Motor Age



Parts and Repairs.

# MOTOR Bargains

**All Motors Guaranteed Perfect or Money Refunded**

MOTORS	
Auburn .....	\$ 75.00
Buda .....	75.00
Cadillac, 11 .....	60.00
E. M. F. ....	55.00
Flanders, 3 speed....	50.00
Flanders, 2 speed....	40.00
Lexington .....	75.00
Locomobile, 6, 1910....	150.00
Mitchell 12 .....	65.00
Overland, 69 .....	60.00
Overland, 61 .....	60.00

Council Bluffs Auto Parts Co.

Parts and Repairs.

**UNIT POWER PLANTS**

Chalmers, 36 .....	100.00
Cole .....	125.00
Detroit .....	75.00
Studebaker, 25, 4....	60.00
Studebaker, 35 .....	60.00

Write Today: D. FOX

Council Bluffs, Iowa

## AUTO PARTS

Full Stock of Parts for

MICHIGAN      DRAGON      LOZIER  
RCH      MORA

We maintain a complete stock of parts for the above cars.

PHILADELPHIA MACHINE WKS.

71 Laurel Street

Philadelphia, Pa.

## AUTO SAVE 50-90% FOR 400 CARS PARTS

POPE, PACKARDS, PIERCE,  
KNOX, ETC.

Motors .....	\$25.00 up	Presto Tanks..\$	4.50 up
Magnetos ....	4.00 "	New Spotlights	3.00 "
Carburetors ..	3.00 "	Generators ..	10.00 "
Rear Axles....	15.00 "	Gears .....	1.00 "
Front Axles..	5.00 "	Bearings ....	1.00 "
Cylinders ....	5.00 "	Radiators ....	10.00 "

Jobbers in Bankrupt Auto  
Supplies

BRIGHTMAN AUTO EXCHANGE

84 Wooster St., Hartford, Conn.

## AUTO PARTS CO.

2039 Farnam St., OMAHA, NEB.

BRANCHES: Sioux City Auto Parts Co., 612 Pearl  
St., Sioux City, Iowa; Twin City Auto Parts Co.,  
1215 Hennepin Ave., Minneapolis, Minn.

## AUTO PARTS CO.

242 So. 11th St., LINCOLN, NEB.

ALL PARTS for all makes of cars, 50% OFF.

## DETROITER and BRIGGS-DETROITER

OWNERS, get your service direct from the factory.  
We alone can furnish immediate and accurate  
shipment of ALL repair parts. Address all cor-  
respondence toDETROITER MOTOR CAR COMPANY  
584 Franklin Street      Detroit, Michigan

## ABBOTT and ABBOTT-DETROIT OWNERS

Are assured prompt, complete, and satis-  
factory service direct from our factory at  
Cleveland, where we have the necessary  
drawings, patterns, tools, fixtures and a  
large supply of parts.All repair orders and correspondence  
should be addressed toTHE ABBOTT MOTOR CAR COMPANY  
Cleveland, Ohio

## STODDARD DAYTON PARTS PAIGE-DETROIT

Rear Axle Bevel Gears and Pinions  
These Are All New PartsTHE DAYTON AUTO PARTS CO.  
357 West 52nd Street      1623A McGee Street  
New York City      Kansas City, Mo.

## SPEED SPECIALTIES—FORD

Underlugs parts for Fords, complete with instructions, per set.....	\$20.00
Counterbalances for the Ford crankshaft, per set .....	12.00
Speedway racing bodies.....	29.50
3 to 1 gears, 2½ to 1, set.....	15.00

CRAIG-HUNT, Inc.

835 Lemcke Bldg.      Indianapolis

## ATTENTION! MARION OWNERS

Parts for All Models

SAVE YOUR MONEY—Buy your Transmis-  
sion and Differential Parts from us, 30% dis-  
count allowed from list on all rear axle parts.MARION MOTOR CAR CO. OF CHICAGO  
2450 Michigan Avenue      Chicago, Ill.

## Krit

OWNERS—Assure yourself of prompt,  
accurate and dependable service by  
ordering Krit repairs direct. We have  
sole possession of all patterns, engi-  
neering records, etc. Address all mail as always, toKRIT MOTOR CAR COMPANY  
Detroit      Michigan

## WIRE WHEELS

New, Rebuilt, Repaired

SINGLE WHEELS OR SETS

All Makes, All Sizes

PARTS AND TOOLS

Quick Delivery, Best Prices

We are prepared to meet any emer-  
gency arising out of the use of wire  
wheels.

WIRE WHEEL REPAIR CO.

146 W. 55th St., New York City

## Michigan

OWNERS—assure yourself  
of prompt, accurate and  
dependable service by  
ordering Michigan repairs  
direct. We have sole possession of all patterns, engi-  
neering records, etc. Address all correspondence  
and orders toMICHIGAN MOTOR CAR PARTS CO.  
Detroit, Michigan

## Imperial Owners

The only way you can be assured of accurate and  
dependable repairs is to deal direct with this com-  
pany which has advantage of all patterns, tools,  
engineering records, etc.IMPERIAL AUTOMOBILE PARTS COMPANY  
Detroit, Michigan

## GEARS

For Transmissions and Differentials.  
Shafts and Pins.

SERVICE GEAR &amp; MACHINE CO.

"Manufacturers for the Trade"  
East Reading      Pennsylvania

## GUARANTEED PARTS

Half List Price—Genuine Packard, Cadillac,  
Buick, and other parts, all good as new. Goods  
shipped inside of 24 hours.

Your money's worth or your money back.

E. W. SAUNDERS CO.  
25 Stanhope Street      BOSTON, MASS.

## Motors Less Than Cost

3- 6 Cyl. Motors, New.....	\$ 75.00
1-12 Cyl. Motors, New.....	350.00
21- 6 Cyl. Lycoming Motors with Trans- missions .....	150.00
Truck Steering Gears.....	6.00
Truck Radiators.....	20.00

Let us know what you are in the market for.  
Send for our special price list of job lots.

AUTO AUCTION CO.

517 Jackson Blvd.

Chicago, Ill.

## USED PARTS FOR SALE

Brush; Buick, 2 cyl., 10-16-17-19-25-25C-27-30-31-35-  
40; Cadillac, 10; Chalmers, 30-36; Cutting, 12; E.  
M. F., all models; Empire, 31; Flanders, 20; Hudson,  
20-33; Hup, 20; Imperial, 34; International Truck 15.  
Model B; Kissel Kar, 10; Maxwell, 2 cyl., Mascott  
Special and I. and E.; Metz, 22; Mitchell, 10-1114,  
4 cyl. and Big Six; Moline 9, Dreadnaught M-35; Over-  
land, 38-39-42-52-59-79; Oakland, 35-40-42; Rambler,  
10; Regal, all models to 13 and Underslung 20.  
THE BONE YARD, Washington, Iowa.

## AUTO WRECKERS

Gears, bearings, axles, parts, tires, joints, Bosch mag-  
netos, starters, carburetors, etc. Big stock, low prices,  
Service.

Cleveland's Largest

Progress Auto Parts Co.

5121 Euclid Avenue      Cleveland, Ohio

Krit Owners We furnish quick service on  
all engines, clutch, trans-  
mission, differential, front and rear axle, steer-  
ing gear, wheels, steering knuckles and cones,  
fenders, frames and body parts—from original  
Krit stock. For all models from 1900-15, inc.

MOTOR CORPORATION

1309 Race Street      Philadelphia, Pa.

## PARTS 50 to 80% Off

Manufacturers' List Price for nearly all makes of cars.  
Write us for prices on Parts Wanted.

I. Wolf Auto Parts and Tire Co.

Phones M. 1579—New 22063  
619 N. Illinois St.      INDIANAPOLIS, IND.

## —IF—

IF IT'S FOR A "FORD" CAR—WE HAVE IT.  
Write for Catalog and Price List.IT'S FOR A "FORD" CAR—WE HAVE IT.  
UNIVERSAL MOTOR SUPPLY CO.

White Plains, New York

**PULLMAN NEW PARTS FOR PULLMAN CARS**  
**OWNERS A Complete Line of All Parts AT A GREATER SAVING!**  
**ATTENTION! ——— We Undersell Them All! ———**  
**PULLMAN AUTO PARTS & SERVICE COMPANY**  
Dept. "P," 115 East 18th St.  
Kansas City, Missouri

When Writing to Advertisers, Please Mention Motor Age

Parts and Repairs. Rebuilding and Repairing.

**Rims—All New and Old Types**

and parts for all makes of rims. Get my prices on spare rims, locking rims, side rings, for any make of car. Quick service. Free rim information.

**KASTNER RIM CO.**  
2125 Michigan Avenue Chicago, Illinois

**RIMS****RIMS****All Makes and Kinds**

Parts, Side and Lock Rings, Bolts and Wedges. Dealers, write for prices

**CITY AUTO TIRE AND SUPPLY CO.**  
1847 E. 24th Street Cleveland, Ohio

**MOTORS and GENERATORS**

A. C. Motors— $\frac{1}{4}$  H. P., \$15.00;  $\frac{3}{4}$  H. P., \$35.00. Battery Charging Sets—100 Robbins & Myers, new machines, \$30.00 each and up. Charging and Lighting Generators, \$10.00 and up. A. C. Motors, 1 and 3 phase, up to 5 H. P., for immediate delivery. Bankruptcy stock. Less than  $\frac{1}{2}$  price. Write for bulletin 89.

**JOHNSTON, West End, Pittsburgh, Pa.**

# Cylinder Grinding

**NEW OVERSIZE PISTON RINGS AND PINS FOR TRUCKS, TRACTORS AND PASSENGER CARS.**

Highest grade machinery equipment, no makeshift tools. Highest grade work fully guaranteed. Patterns for all pistons, 20,000 piston rings in stock.

**Aluminite Pistons and Connecting Rods**

put six cylinder smoothness into four cylinder motors, give any motor more power, more speed, quicker get away and more miles per gallon. FOR TRUCKS AND TRACTORS, increase the power of the motor and save the bearings and cylinders.

**Power Plus Cylinder Heads For Ford Cars**

Keep the motor cool, especially efficient on Fords converted into trucks and tractors.

**GUARANTEED MOTORS**, complete stock new and rebuilt for cars, trucks and tractors. Parts for all motors and cars. Motors rebuilt. Our machinery equipment and factory space recently doubled insuring prompt delivery and perfect work. **SPECIAL ATTENTION GIVEN TO TRUCKS AND TRACTORS.**

ASK OUR CUSTOMERS

**Green Engineering Co.**  
Dayton, Ohio

# CYLINDERS

Reground—Fitted with light iron pistons; we weld anything but a broken heart. Scored cylinders filled. Radiators repaired and recored. Special prices to garagemen.

**GOODIN COMPANY**  
335 S. Lawrence Wichita, Kansas

Rebuilding and Repairing. Tires.

# Cylinders Reground

Over 800 Piston Patterns Always in Stock.

Our Expert Mechanics and our Highest Grade Equipment are your guarantee for highest class workmanship.

Our Special Light Alloy Pistons will give you More Power—More Speed; we also do Gear Cutting of Spur and Bevel Gears.

Write to Us Today

**Auto Engine Works**

St. Paul, Minn.

**WE GRIND**

Cylinders and fit special heat-treated Pistons. Welding of all kinds of Metals. Gear Cutting of all kinds.

**PONDELICK BROS.**

Largest Mfrs. of Duplicate Auto Parts in U. S.  
Leavitt St. & Jackson Blvd. Chicago, Ill.

**Scored Cylinders Repaired**

We use the same pistons. General machine work for foreign and American cars. All parts duplicated. Welding of all metals. Manufacturers of Catelain Hose Coupling, Ever-Ready Starters, U. S. Shock Eliminators. Quick service, satisfaction guaranteed.

**ANDRE CATELAIN**

1446-8 Indiana Avenue Chicago, Ill.

# CRANK SHAFTS REGROUND NOT FILED AND REGROUND—BUT REGROUND ON SPECIAL GRINDERS!

**CYLINDERS REGROUND**

**STAFFORD SUPREME SERVICE**  
**STAFFORD MOTOR COMPANY**  
2201-09 Campbell Avenue. Kansas City, Mo.

**PROMPT SHIPMENTS MADE AUTO TIRES AND TUBES FIRSTS & SECONDS EXPRESS PREPAID ON ALL ORDERS**

At the following prices we give no mileage guarantee, but will make reasonable adjustment should tire prove unsatisfactory. All tires sent in for adjustment must be prepaid:

Size.	Non-Skid. Tubes.	Size.	Non-Skid. Tubes.	Size.	Non-Skid. Tubes.
28x3.....	\$ 8.00 \$2.00	31x4.....	\$16.45 \$3.10	34x4 $\frac{1}{2}$ .....	\$22.95 \$4.05
30x3.....	8.45 2.20	32x4.....	16.95 3.25	35x4 $\frac{1}{2}$ .....	23.60 4.15
30x3 $\frac{1}{2}$ .....	11.30 2.40	33x4.....	17.25 3.40	36x4 $\frac{1}{2}$ .....	23.95 4.25
31x3 $\frac{1}{2}$ .....	11.95 2.50	34x4.....	17.95 3.60	37x4 $\frac{1}{2}$ .....	24.95 4.35
32x3 $\frac{1}{2}$ .....	12.95 2.65	35x4.....	18.45 3.75	38x5.....	26.25 4.55
34x3 $\frac{1}{2}$ .....	14.45 2.86	36x4.....	18.95 3.90	39x5.....	27.00 4.75
30x4.....	16.00 3.00				

"Special Proposition to Live Dealers"

Express prepaid on all orders. A 2% discount may be deducted, if check in full accompanies order. Otherwise a 10% deposit required. Balance C. O. D.

**LEADER TIRE & RUBBER COMPANY**

709 North Broad Street

Philadelphia, Pa.

**HIGH GRADE QUALITY TIRES & TUBES****Manufacturers' Surplus Stock of Factory Seconds**

Size	Plain	Non-Skid Tubes	Size	Plain	Non-Skid Tubes
28x3.....	\$ 9.15	\$ 9.55 \$1.80	34x4.....	\$19.30	\$20.25 \$3.40
30x3.....	8.70	9.40 1.95	36x4.....	20.75	21.50 3.65
30x3 $\frac{1}{2}$ .....	11.35	11.95 2.30	34x4 $\frac{1}{2}$ .....	24.85	27.45 4.15
32x3 $\frac{1}{2}$ .....	12.75	14.45 2.40	35x4 $\frac{1}{2}$ .....	25.90	27.60 4.30
31x4.....	17.65	18.50 3.00	36x4 $\frac{1}{2}$ .....	26.70	29.20 4.40
32x4.....	18.10	19.00 3.05	37x5.....	33.75	34.45 5.30
33x4.....	18.75	19.60 3.25	38x5.....	32.75	34.40

We warrant each and every casing to give satisfactory service, but do not give any definite mileage guarantee

5% FOR CASH IN FULL WITH ORDER

Save this discount, as upon arrival of shipment you still have the privilege of returning any items which do not come up to expectations for full cash refund.

**STERLING TIRE & SUPPLY HOUSE**

1355 Michigan Avenue

CHICAGO, ILL.

When Writing to Advertisers, Please Mention Motor Age

Rebuilding and Repairing. Tires.

**CYLINDER REGRINDING****PISTONS****RINGS****PINS**

Largest in Middle West

Our complete records give Permanence and Continued Service

**BUTLER MFG. CO.**

Established 1897

1115 E. Georgia

Indianapolis

**CYLINDERS REGROUND**

including new pistons and rings. Any size—\$7 to \$8 per cylinder. All our work guaranteed. Quick shipments. Let us prove our ability on your next job.

**NEUPERT MFG. COMPANY**

82 Lark Street

Buffalo, N. Y.

# CYLINDERS

**REGROUND.** Piston Rings and Wrist Pins made to fit. All work Guaranteed. Most Accurate Machinery. Skilled Mechanics.

**Modern Auto Repair & Reconstruction Co.**  
4605-4613 Olive Street, St. Louis, Mo.

# CYLINDER S

**Reground—We Weld Anything**

Fitted with cast iron or light pistons; leak-proof or plain piston rings. Best equipped shop in the country.

Quick Service—Reasonable Prices—Gear Cutting  
**SIOUX CITY WELDING & MACHINERY CO.**  
Dept. MA Sioux City, Iowa

**HIGH GRADE TIRES AND TUBES**

Factory Seconds, Unguaranteed, at Interesting Prices. Also complete line of Firsts.

Write Us Your Needs

**ACORN TIRE & REPAIR CO.**  
1350-54 South Michigan Ave. CHICAGO, ILL.



Tires.

Tires.

# TIRES & TUBES

SLIGHTLY USED AND FACTORY REPAIRED

TIRES AND TUBES—QUALITY ABOVE ALL

The **QUALITY** of our tires and tubes is superlative, the **PRICE** cannot be equaled and our **SERVICE** cannot be excelled.

A satisfied customer is our biggest asset, therefore we must satisfy you.

Size	Tires	Tubes	Size	Tires	Tubes	Size	Tires	Tubes
30x3.....	\$ 4.00	\$1.35	32x4.....	\$ 7.00	\$1.60	35x4½.....	\$ 8.50	\$1.80
30x3½.....	5.00	1.45	33x4.....	7.75	1.70	36x4½.....	8.75	1.85
31x3½.....	5.25	1.50	34x4.....	7.75	1.70	37x4½.....	9.25	1.90
32x3½.....	5.50	1.50	35x4.....	8.00	1.75	35x5.....	9.50	2.00
34x3½.....	6.00	1.60	36x4.....	8.00	1.75	36x5.....	9.50	2.00
31x4.....	6.25	1.65	34x4½.....	8.25	1.75	37x5.....	10.00	2.20

Send \$1.00 deposit with each tire ordered. Tires will be sent promptly C. O. D., with privilege of examination. Specify style of rim to avoid delay.

Our slightly used tires bear no mileage guarantee; but in the event that they do not give service in proportion to the price, you may return them to us by prepaid express and we will cheerfully make a fair adjustment.

*We carry a complete stock of New Tires—Write for Prices*

**LINCOLN TIRE & SUPPLY CO.**  
1463 S. Michigan Ave. Chicago, Illinois

## SHORTAGE OF TIRES

IS PREVALENT OVER ENTIRE COUNTRY  
WE HAVE ALL SIZES OF TIRES IN SOME

### TEN POPULAR STANDARD MAKES

Only nine (9) sizes of tires are permitted to be made now. Hustle and get yourself a goodly supply of your size at the following prices. Odd sizes of tires our specialty. Always in stock.

Size	Plain	Non-Skid	Size	Plain	Non-Skid
30x3.....	\$10.56	\$11.99	33x4.....	\$20.57	\$23.90
30x3½.....	13.14	14.79	34x4.....	22.93	24.79
32x3½.....	15.23	16.11	35x4½.....	29.31	32.83
31x4.....	19.85	21.65	36x4½.....	24.69	30.36
32x4.....	20.15	22.95	37x5.....	35.69	44.50

Although at above prices these tires bear no mileage guarantee, we will make reasonable adjustments should they prove unsatisfactory. Specify style of rim to avoid delay.

**CHAS. E. MILLER, Inc.**

812 14th Street, N. W.

WASHINGTON, D. C.

## NEW AND USED TIRES

*Best Values Ever Offered for the Money*

NEW TIRES			USED TIRES		
Size	Pl.	Size	Size	Size	Size
30x3.....	\$9.00	34x4.....	\$20.75	30x3.....	\$4.00
30x3 N. S.....	9.50	34x4½.....	26.50	30x3½.....	5.00
30x3½.....	12.40	35x4½.....	27.70	32x3½.....	6.50
32x3½.....	14.55	36x4½.....	28.15	31x4.....	6.50
31x4.....	19.00	35x5.....	31.65	32x4.....	7.00
32x4.....	19.40	37x5.....	33.50	33x4.....	7.50
33x4.....	20.25			34x4.....	8.50

All goods shipped promptly. \$1.00 deposit required with each tire ordered; balance C. O. D., subject to examination, at the above prices without a guarantee; specify whether new or used, clincher or straight side. Special proposition to dealers.

**ROYAL TIRE & SUPPLY COMPANY**  
1461 Michigan Ave., Chicago, Ill. Phone—Calumet 2553

*When Writing to Advertisers, Please Mention Motor Age*

Tires.

### Special Bargains in SLIGHTLY USED TIRES

The kind that will satisfy all customers.

30x3.....	\$4.00	34x4.....	\$ 8.00
30x3½.....	5.00	34x4½.....	8.25
32x3½.....	6.00	35x4½.....	8.50
31x4.....	6.50	36x4½.....	8.75
32x4.....	7.00	37x4½.....	9.50
33x4.....	7.75	37x5.....	10.00

Send \$1.00 deposit with each tire ordered. Balance C. O. D., subject to examination. Specify if Clincher, Q. D., or Straight Side.

**No Mileage Guarantee at the Above Prices**

**American Tire & Vulcanizing Co.**

Phone: Calumet 5170

2136 S. MICHIGAN AVE. CHICAGO, ILL.

## \$100,000 Stock

STANDARD MAKE NEW TIRES  
AT GREATLY REDUCED  
PRICES

**TIRES AND TUBES**

No definite mileage guarantee, but reasonable adjustments cheerfully made.

**SPECIAL PRICES TO DEALERS ON QUANTITY ORDERS**

**SERLIN TIRE CO.**

1300-1302 Michigan Ave. Chicago

## HIGH GRADE TIRES & TUBES

BEST VALUES ON THE MARKET  
A Trial Order Will Convince You

*Send for Prices*

No Mileage Guarantee at Our Low Prices. Special Proposition to Dealers

**Armstrong Tire & Vulcanizing Co.**

1336 Michigan Ave. Chicago, Ill.

Branch: 1612 Michigan Avenue

Phones: Calumet 5212, Calumet 2199

The Advertising of Accredited Firms and responsible individuals is solicited for this Section, as we are desirous of furnishing our thousands of readers with the best ACCESSORIES, SUPPLIES and SERVICE.

*Let us give you complete information*

**Clearing House Adv. Dept.**

Mallers Bldg. Motor Age Chicago

## DO YOU NEED HELP?

HAVE YOU SPECIAL POSITIONS YOU ARE UNABLE TO FILL?

MOTOR AGE reaches thousands of MOTOR CAR experts.

Your requirements stated in this section will put you into communication with a number of applicants that can fill your position but from whom you can take your choice.

**Clearing House Adv. Dept.**

MOTOR AGE, Mallers Bldg., Chicago

Tires, Magnets and Service Stations.  
Radiator and Lamp Repairing.

Tires, Magnets and Service Stations.  
Radiator and Lamp Repairing.

Supplies and Accessories. Miscellaneous.  
Mailing Lists. Patent Attorneys.

## TIRES SPECIAL SPECIAL SPECIAL TUBES

ECONOMY TO MOTORISTS

Select Your Supply Now for The Season—Slightly Used and Factory Repaired  
**TIRES and TUBES—A Trial Will Convince You**

Largest and most complete stock of slightly used tires in all makes for immediate shipment.—NO JUNK.

Size	Tires	Tubes	Size	Tires	Tubes
30x3.....	4.00	\$1.35	35x4.....	8.00	1.75
30x3½.....	5.00	1.45	36x4.....	8.00	1.75
31x3½.....	5.25	1.50	34x4½.....	8.25	1.75
32x3½.....	5.50	1.50	35x4½.....	8.50	1.80
34x3½.....	6.00	1.60	36x4½.....	8.75	1.85
31x4.....	6.25	1.65	37x4½.....	9.25	1.90
32x4.....	7.00	1.60	35x5.....	9.50	2.00
33x4.....	7.75	1.70	36x5.....	9.50	2.00
34x4.....	7.75	1.70	37x5.....	10.00	2.20

Freight Prepaid on all orders exceeding \$50.00 when check in full accompanies order, otherwise \$1.00 deposit with each tire ordered. Specify style of rim to avoid delay.

Although at the above prices these tires bear no mileage guarantee, we will make reasonable adjustments should they prove unsatisfactory. All tires sent in for adjustment must be prepaid.

We also carry a complete stock of new tires. Write for prices

**AETNA TIRE & SUPPLY COMPANY**  
1429 Michigan Avenue Chicago, Illinois

## NEUTRALINE

Will Save Your Skin

IT IS {  
HEALING  
HARMLESS  
ODORLESS  
ANTISEPTIC  
CLEANSING  
NEUTRALIZING

Battery Service men use it to protect and heal the skin from acid burns. Sold by important jobbers in all principal cities.

**THE MCGRAW COMPANY**  
Omaha Manufacturers Sioux City

### AFFA Steering Spindle Adjuster

Also other Specialties for  
Jobbers, Dealers, write for **FORDS**  
prices. Goods guaranteed.

**AFFA SPECIALTY CO.**  
34-B Southbridge St. Worcester, Mass.

## Send It to Detroit

Official Service and Parts Representatives for  
Atwater-Kent, Auto-Lite, Berling, Bijur, Connecticut, Delco, Dyneto, Heinze-Springfield, K.-W. Ignition, Klaxon, Remy, Simms-Magnets, Westinghouse, etc.

COMPLETE STOCK OF  
**GENUINE PARTS**  
All work and parts guaranteed  
**AUTO. ELECTRIC & SERVICE CORP.**

11 TO 19 SELDEN AVENUE  
PHONE: GLENDALE 3353

### ELECTRIC MOTORS

Quantity Westinghouse and General Electric  
¾ H. P. A. C. Motors, 110 volts, 60 cycle, 1,750 r.p.m. Brand new, never unpacked. Guaranteed perfect. Price, \$25.00. Some at \$16.50.

**A. LINCOLN SUPPLY COMPANY**  
Ephrata, Penn.

### BOSCH MAGNETOS

We buy and sell all models. We are in position to supply quantities of any model at prices that will surprise you. Repairmen, write us your requirements. Parts and platinum points for all makes. All goods guaranteed to give perfect satisfaction or money refunded.

**WIGHT & MANUS**  
418 S. Sacramento Blvd. Chicago, Ill.

## Samuel L. Winternitz & Company

### AUCTIONEERS

Largest Liquidators of Motor Plants  
FIRST NAT. BANK BLDG. CHICAGO, ILL.

### We'll Sell Your Products

Active selling agency, covering central states, will take on one or two additional lines automobile accessories. Selling now to jobbers and truck mfrs.

**WOLVERINE METAL SALES CO.**  
Detroit, Michigan

## Expert Repair Service

ON EVERY KNOWN  
MAGNETO IGNITION SYSTEM  
GENERATOR STARTING MOTOR  
All Repairs Promptly Executed  
All orders for repair parts shipped the day orders are received.  
AMERICA'S MOST COMPLETE  
IGNITION, LIGHTING AND STARTING  
INSTITUTION

**PELLET MAGNETO CO.**  
Twenty-fifth and Wabash Avenue.  
CHICAGO

### RADIATORS

We repair Radiators of all kinds—Any  
Make or Any Style

**MITCHELL RADIATOR REPAIR COMPANY**  
933 Ft. Wayne Ave. Indiana  
Buy and Sell Used Radiators

A NEW Radiator or Your Old One Repaired  
Repairs in one day—a new radiator in two days.  
Mfrs. of Ford Racing bodies, fenders, hoods, gas tanks, and all auto sheet metal works.

**WABASH AUTO RADIATOR MFG CO.**  
1117-19-21-23 S. Wabash Ave., Chicago

### AUTO MAILING LIST

44,755 Auto Dealers, U. S. .... \$3.00 per M.  
7,949 Ford Dealers, U. S. .... \$20.00, or 4.00 per M.  
5,519 Truck Dealers, U. S. .... \$12.00, or 4.00 per M.  
(Showing make of truck handled.)  
150,000 Truck Owners, U. S. .... 7.50 per M.  
5,400 Truck Owners in Chicago,  
\$15.00, or ..... 3.50 per M.  
46,943 Garages, U. S. .... 3.00 per M.  
55,967 Auto Supplies, Retail, U. S. .... 3.00 per M.  
45,054 Repair Shops ..... 3.00 per M.  
404 Auto Mfrs. .... 3.00 per M.  
73,674 Auto Dealers, Garages, Supplies and Repairs in one list,  
no duplicates ..... 3.00 per M.  
1,502 Auto Supply Jobbers ..... \$5.00  
Complete list auto owners and Ford owners, \$2.50 per M. Further particulars

**TRADE CIRCULAR ADDRESSING CO.**  
166 W. Adams St. (Franklin 1182) Chicago

## If It's Electrical

WE CAN FIX IT

Any Starting, Lighting, Ignition System.

WE OFFICIALLY REPRESENT  
WESTINGHOUSE CONNECTICUT  
K. W. IGNITION DYNETO  
BERLING MAGNETO BENDIX DRIVES  
PHILBRIN JESCO (Jones Starter)  
BRANFORD CARBURETOR

VAN SICKLEN SPEEDOMETERS  
WALTHAM SPEEDOMETERS  
HEINZE SPRINGFIELD FORD STARTERS  
LET THE MAN WHO KNOWS  
HANDLE YOUR REPAIR WORK

**Arthur Jones Electric Co.**  
ESTABLISHED 1903  
2837 S. STATE ST. CHICAGO, ILL.

### RADIATORS

OUR HONEYCOMB RADIATOR embodies  
STRENGTH COOLING POWER NEATNESS  
Repairing and recoring old radiators. Everything in the automobile sheet metal line

We solicit your inquiries  
**ILLINOIS AUTO SHEET METAL WORKS**  
Veteran Radiator Experts of the West  
3200 S. Michigan Ave. Chicago, Ill.

MANY FIRMS ARE GETTING BUSINESS by telling of their facilities in these sections. Why not you?

Full information gladly given  
**CLASSIFIED DEPARTMENTS**  
Motor Age, Mallers Building, Chicago

### INDIANA AUTO LISTS

200,000 names, compiled by counties in type-written form, showing name, address, make, model and 1918 registration number. Special lists of any make of car. Can furnish list dealers in any state.

**CAMPBELL CIRCULAR ADVERTISING CO.**  
PRINTING MAILING ADDRESSING  
240 South Meridian St. Indianapolis, Ind.

Automobile dealers, garagemen and mechanics, locate your electric troubles quickly and accurately by using Phillips Engineering Company's test sets and Auto Electric Systems Publishing Company's information books. Model 302 test set complete, \$25.00. Set of 7 books covering automobile electric systems, \$2.75 postpaid. Complete catalog free.

**PHILLIPS ENGINEERING CO., Dayton, Ohio.**

Pioneer

## RADIATOR Manufacturers

Rebuilding, Repairing, and Manufacturing of Radiators for any make of car. Why send your Radiator down East when you can ship to us; save time, expense, freight, money, and be assured of expert workmanship? Our prices are right. We make new Radiators and allow for old ones.

**TODD MANUFACTURING CO.** Minneapolis, Minn.

### C. L. PARKER

Formerly Member Examining Corps, United States Patent Office

**ATTORNEY-AT-LAW AND SOLICITOR OF PATENTS**  
American and foreign Patents secured. Searches made to determine patentability and validity. Patent suits conducted. Pamphlet of instructions sent upon request.

McGill Building, WASHINGTON, D. C.



Manufacturers' Opportunities. Help Wanted. Manufacturers' Opportunities. Help Wanted.

**THE GRAHAM-WHITE CO., Ltd.**

having made arrangements for opening offices and showrooms in London, to act as sole Selling Agents and representatives for leading American Manufacturers, invite correspondence from established firms and companies. Makers of machinery—Machine Tools, Labor Saving Machinery, Motor Cars, etc., who are able to compete for the trade—after the war, in the English markets, will oblige by placing themselves in communication, giving fullest details of their manufactures, etc., to

**THE GRAHAM-WHITE CO., Ltd.**

12 Regent Street

Pall Mall, London, S. W. I.

## Assembly Executive Liberty Aircraft Motors

An executive to take charge of all assembly departments in our Liberty airplane motor plant is wanted at once. The man who can qualify should have had several years of experience in charge of assembly of high class automobile engines. He must know how to lead men and to put speed into production.

To a capable man who is not now connected with a plant engaged on Government work, this is an opportunity to change to 100% war work at once. We cannot consider the application of men now employed on war contracts.

**Box E-885, Care of MOTOR AGE**

**A FACTORY IN THE MIDDLE WEST**

with a production capacity of twenty thousand truck motors desires to engage the service of a production manager whose ability can handle this and a further substantial increase in output. Address

**Box E-874, care of MOTOR AGE**

All Classified forms now close Friday noon. Be sure all orders and copy are mailed to reach us not later than Friday morning.

**MOTOR AGE**

**CONTRACT WORK**

Advertisers in this section have facilities at their disposal to take on additional work on contract. Automobile specialties of all kinds manufactured on contract basis. Special machinery, press work, auto machine work, foundry work, automatic screw machine work.

**PARTS and ACCESSORIES**

We are in a position to manufacture PARTS and ACCESSORIES. Will manufacture on contract or royalty basis. Prompt attention and delivery. Send us your proposition and blue prints.

**SCHLOEMER MFG. CO.**  
388-50-92 Division St. Oshkosh, Wis.

Situations Wanted.

**SITUATION WANTED RATES**

30c per line; minimum price, \$1.20

Payment in advance required. Compute six words to the line. Forms close Friday noon each week.

**POSITION WANTED—IN FLORIDA WITH** manufacturers of war supplies or as foreman of garage. Ten years' experience in automobile business. Address Box E 886, care MOTOR AGE.

**SPECIAL RATE**

and

**TIMELY ADVICE**

to the Man Looking  
for a Position

**Mechanics, Salesmen****Engineers, Superintendents****Managers, Chauffeurs**

and men in all branches of the retail trade, garage, repairshop and motor car industry, are being employed daily in many sections of the country. If you want one of these positions and can fill it, why not go after it?

The question is, however, how can you reach the man who will give you the position.

**Let Motor Age Answer the Question for you.**

**WANTED—RESPONSIBLE POSITION WITH** well rated accessory house or garage, by experienced young man of business ability. Address Box 421, care MOTOR AGE.

An advertisement occupying the above space can be inserted in the "Situations Wanted" section one time for \$1.20; twice for \$2.40, or three times for \$3.60.

One insertion is good—two is better, but three insertions give a real opportunity for effective results. The investment is reasonable, especially when you stop to consider there is absolutely no waste circulation.

**WHY TALK FURTHER?**

Send your order and copy now, or, we will write your advertisement free of charge on receipt of full data as to experience, age and any other information which will help us to make up an attractive advertisement for you.

**SITUATION WANTED RATES:**

30c per line, minimum price, \$1.20.

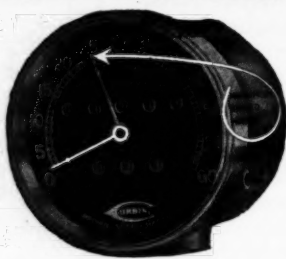
A full remittance must be sent with each order. Forms close Friday noon preceding date of issue, which is Thursday each week.

**—Quick Action Counts—****MOTOR AGE****The Mellers Building Chicago**

## CORBIN-BROWN SPEEDOMETERS

### It Pays to Be Sure

Motorists say that their satisfaction and peace of mind is increased on long summer trips through the use of the



### CORBIN-BROWN SPEEDOMETER

They have the positive knowledge, when traveling over unfamiliar roads, that their mileage is being recorded with unfailing accuracy—that they can check it against the road map at any time and learn their position on the route with absolute reliability.

In addition, they can have the convenience of the Maximum Speed Hand, fitted as an extra. This hand registers the highest speed and remains at that point until returned to zero. Eliminates the bother and risk of watching the speedometer to learn the car's speed while traveling at a fast pace.

Catalog on Request

### CORBIN SCREW CORPORATION

AMERICAN HARDWARE CORPORATION, Successor

New Britain, Conn.

BRANCHES: New York Chicago Philadelphia

BUILT FOR ACCURACY

**Soft Tires Are Hard  
on the Pocketbook**

*Keeping your air  
pressure up  
means keeping  
your tire ex-  
pense down.*

Test your air  
pressure  
daily  
with a

TWITCHELL  
AIR GAUGE

and double the life  
of your tires.

At your dealer or

**TWITCHELL GAUGE CO.**  
1516 S. Wabash Ave. Chicago, Ill.  
**PRICE, \$1.50**

# Index to the

Acheson Graphite Company.....	80
Albertson & Company.....	99
Amazon Rubber Company.....	100
American Accessories Company.....	100
American Bronze Corporation.....	74
American Cushion Spring Company.....	99
American Machine Products Company.....	88
Anderson Electrical Specialty Company.....	92
Atwater-Kent Manufacturing Company.....	98
Auburn Automobile Company.....	94
Automobile Devices Company.....	100
Automotive Industries.....	96

Ballman-Whitten Manufacturing Company.....	98
Barkoot, K. G., Company.....	100
Bearings Company of America.....	96
Bergie National Spark Plug Company.....	3
Bethlehem Motors Corporation.....	100
Billings & Spencer Company.....	77
Black & Decker Manufacturing Company.....	92
Blood Brothers Machine Company.....	97
Bosch Magneto Company.....	92
Bretson Manufacturing Company.....	98
Brown, J. W., Manufacturing Company.....	92
Brown-Lipe-Chapin Company.....	60
Brunner Manufacturing Company.....	87
Brunswick-Balke-Collender Company.....	6
Buell Manufacturing Company.....	93
Burd High Compression Ring Company.....	98

Camden-Anchor-Rockland Machine Company.....	91
Carr, F. S., Company.....	64
Cassidy, Edward A., Company.....	54-69
Chalmers Motors Company.....	112
Champion Ignition Company.....	70-71
Chase, L. C., Company.....	92
Clearing House.....	101 to 109
Commerce Motor Car Company.....	88
Continental Motors Corporation.....	100
Corbin Screw Corporation.....	110
Covet Gear Company.....	56
Curtis Pneumatic Machinery Company.....	86

Defender Auto Lock Company.....	73
Detroit Accessories Corporation.....	96
Disco Electric Manufacturing Company.....	98
Duplex Cantilever Spring Company.....	88
Dyneto Electric Company.....	99

Eclipse Machine Company.....	96
Eclipse Valve Grinder Company.....	93
Econ-O-Kleen Fuel Company.....	98
Eisemann Magneto Company.....	63
Elgin Motor Car Corporation.....	95
European Bureau of American Manufacturers.....	88

Fafnir Bearing Company.....	96
Fedders Manufacturing Company.....	4
Firestone Steel Products Company.....	59
Four Wheel Drive Auto Company.....	61
France Manufacturing Company.....	100
Fulton Motor Truck Company.....	62

General Appliance Company.....	93
General Tire & Rubber Company.....	72
Goodrich-Lenhardt Manufacturing Company.....	100
Gordon, J. P., Company.....	99
Gramoline Company.....	90
Guarantee Liquid Measure Company.....	97

Hall-Thompson Company.....	111
Halladay, L. P., Company.....	89
Hartford, Edward V., Incorporated.....	92
Hess-Bright Manufacturing Company.....	58
Higgins Spring and Axle Company.....	97
Hill Pump Valve Company.....	Second Cover
Hollenden Hotel.....	89
Hoover Steel Ball Company.....	91

Janney, Steinmetz & Company.....	94
Jenkins Vulcan Spring Company.....	98
Johnson, S. C., & Son.....	Front Cover

K. B. C. Company.....	95
Kellogg Manufacturing Company.....	100
Kimball Tire Case Manufacturing Company.....	95
Kissel Motor Car Company.....	57
Kokomo Electric Company.....	99
Kol-Ben Wheel Company.....	96



# Advertisements

Lane Motor Truck Company.....	87
Laurel Motors Corporation.....	89
Lenox Hotel.....	90
Liberty Loan.....	82-83
Liberty Top and Tire Company.....	100

McCord Manufacturing Company.....	85
Mechanical Belt Company.....	84
Mercer Automobile Company.....	99
Moline Plow Company.....	65 to 68
Motor World.....	91
Mutty, L. J., Company.....	76

National Cash Register Company.....	78
National Wire Wheel Works.....	94
New Departure Manufacturing Company.....	94
New York and New Jersey Lubricant Company.....	95

Ohio Grease Company.....	111
Onida Motor Truck Company.....	84

Peerless Puncture Proof Tire Company.....	97
Perma-Loc Manufacturing Company.....	75
Profexal Company.....	86

Remington Manufacturing Company.....	92
Rogers Brothers Company.....	94

Schutte, Charles, Body Company.....	96
Selden Truck Sales Company.....	97
Shaler, C. A., Company.....	100
Simplicity Wheel Company.....	99
Simpson Truck Company.....	90
Sparks-Withington Company.....	98
Spittdorf Electrical Company.....	79
Stadeker Metal Specialty Company.....	93
Standard Motor Truck Company.....	95
Stevens & Company.....	94
Storm Manufacturing Company.....	95
Stromberg Motor Device Company.....	95
Sunderman Corporation.....	100

Thermoid Rubber Company.....	81
Tungster Manufacturing Company.....	51
Twitchell Gauge Company.....	110

Universal Tool Company.....	97
U. S. Ball Bearing Manufacturing Company.....	52-53
U. S. Light and Heat Corporation.....	95

Vacuum Muffler Company.....	97
-----------------------------	----

Waltham Watch Company.....	1
Warren, John W., Company.....	96
Waukesha Motor Company.....	96
Webber, P. H., Company.....	2
Weston Electrical Instrument Company.....	99
Wheeler-Schebler Carburetor Company.....	94
Whitney Manufacturing Company.....	89
Willard Storage Battery Company.....	55
Willys-Overland Company.....	Back Cover
Winton Company.....	97
Wire Wheel Corporation of America.....	84
Wisconsin Motor Manufacturing Company.....	91
Wonder Sales Company.....	94

Young, L. A., Industries.....	100
-------------------------------	-----

Zenith Carburetor Company.....	Third Cover
--------------------------------	-------------

THE ADVERTISERS' INDEX is published as a convenience and not as a part of the advertising contract. Every care will be taken to index correctly. No allowance will be made for errors or failure to insert.



## Ohio Karbon Killer

Keeps Spark Plugs, Valves, Pistons and Cylinders free from carbon—all the time.

Don't let your engine choke up with carbon until it can't run, and then remove it—**Prevent it!**

Put Ohio Karbon Killer in your gasoline, and prevent the formation of carbon, thus keeping your engine in the very best condition at all times.

Costs \$1.00 per lb., and a pound treats 480 gallons of gas. Get a can right now, and give your engine a chance. If your dealer cannot supply you, send your dollar to

**THE OHIO GREASE COMPANY**  
Box 121, LOUDONVILLE, OHIO



Here is the practical, successful working-out of the idea of a Liquid Carbon Remover—with its vast economies to car owners and its aid to efficient motoring.

The great saving in gasoline by keeping cylinders carbon-free; the great economy of the Carbon Remover over the boring-out method; the great advantage of cleaning cylinders without laying up the car—all are realized with this

## WONDER WORKER

article. The Wonder-Worker Carbon Remover gets results in **30 minutes**—without the slightest injury to the motor. It loosens the carbon from the metal—so that it's **blown out** through the exhaust.

*Let Wonder-Worker Carbon Remover prove to you how the Wonder-Worker Specialties actually deliver results that have only been claims in the past. Description and prices of complete line in catalogue; copy should be in your hands.*

**THE HALL-THOMPSON CO.**  
HARTFORD :: :: CONNECTICUT



## Always Have Been—Are Now—Always Will Be

Chalmers Motor Cars always have been good motor cars.

At times Chalmers cars have been just a little too good—for the price we sold them at.

Last year, for example—the price should have been a few hundred dollars more.

But Chalmers quality is of the kind that is more than skin deep—and the user sees it better than does the prospective buyer.

Right now Chalmers Motor Cars are reaping the reward of Chalmers quality in the past.

Chalmers demand is cumulative—it grows with every car sold for every additional owner becomes a Chalmers enthusiast.

That's why Chalmers dealers so seldom change.

Once a distributor or a dealer secures this line, he is made—he is established in a permanent and a profitable business.

Now is a good time to plan for the future—

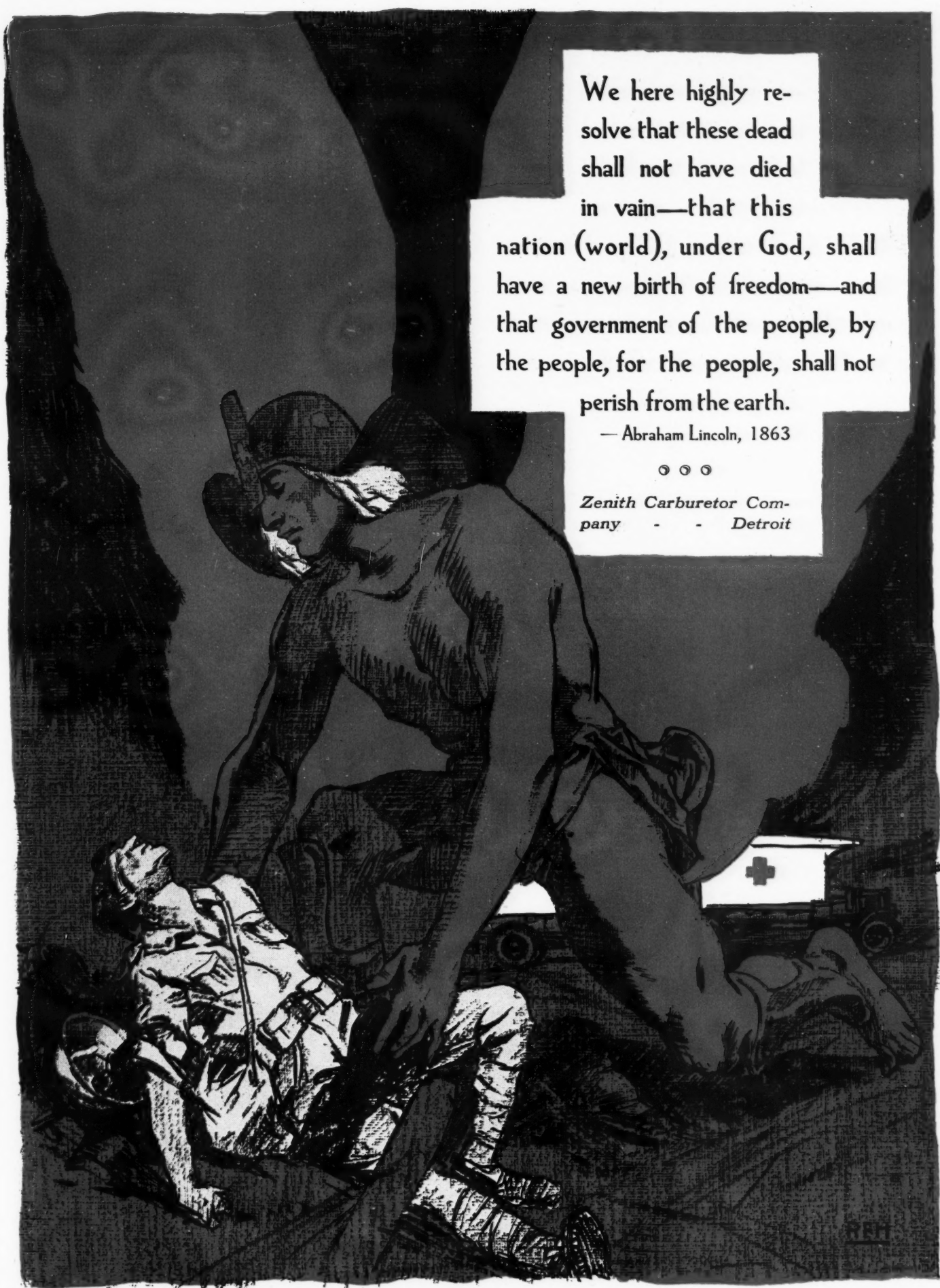
The dealer who ceases to consider the conditions of the moment, but looks to the long future ahead, is the one that will be the leader in that future time of big business and prosperity.

**Chalmers Motor Company**  
Detroit, Michigan



*When Writing to Advertisers, Please Mention Motor Age.*





We here highly re-  
solve that these dead  
shall not have died  
in vain—that this  
nation (world), under God, shall  
have a new birth of freedom—and  
that government of the people, by  
the people, for the people, shall not  
perish from the earth.

— Abraham Lincoln, 1863

○ ○ ○

*Zenith Carburetor Com-  
pany - - Detroit*



## Our Motto—Your Motto

Work with motor cars as conscientiously at home as—

Others are fighting with them at the front.

**Overland**  
TRADE MARK REG.  
The Thrift Car

Willys-Overland Inc., Toledo, Ohio  
Willys-Knight Touring Cars, Coupes, Sedans, Limousines  
Overland Motor Cars and Light Commercial Cars  
Canadian Factory, West Toronto, Canada